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City County State

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## Contents of This Issue.



## CITY ENGINEERING AND MOSQUITO CONTROL.

A general idea seems to prevail that mosquito control, insofar as it is a governmental function, concerns the health department only. But in only a part of this country is health believed to be involved in the problem, while in all sections comfort is advanced by eliminating the pests.

Dust and smoke elimination are entrusted to engineers, and to a considerable extent that of mosquitoes must be also. For mosquitoes cannot breed without water, and removing the breeding spots involves drainage of swamps and pools, regulation of streams, reconstruction of catchbasins, etc., while the formation of new spots can be prevented by the proper planning of highway embankments, sewer inlets, grading of parks and other public lands, and all other public works which, if not planned with this idea in view, might serve to collect water wherein mosquitoes could breed. In most cases only forethought is needed to avoid the creation of such breeding places, the additional cost involved being little if anything. Some detailed suggestions along this line are given in the first article in this issue.

## AN EQUALIZING RESERVOIR FOR LABOR.

Labor and the laborer present the supreme problem in America today. Of this problem, the feature of involuntary unemployment does not at present appear as an important element, but it has been in the past and undoubtedly will be again.

That there has always been this problem of intermittent unemployment is not creditable to our civilization. It would seem possible to devise some system by which the occasional labor surplus could be utilized to the benefit of both the laborer and the public. Such utilization would probably need to be on public rather than private work, by the city, state or federal government. If properly planned and directed, there would seem to be no reason why the benefit to the public from this should not be nearly as great as from any public works.

It would seem that cities might aid to this end by providing and keeping constantly available, public works that can be taken up at any time, by either large or small gangs, and that, while desirable, are not pressingly necessary. Work of this kind can, we believe, be found in almost any city or town. Grading and the general improvement of parks and of the grounds about pumping stations, sewage and refuse disposal plants, railway stations and other public areas, de-silting reservoirs, and draining low lands are illustrations of what we have in mind.

To be done to advantage, such work should be planned ahead and not on the spur of a sudden demand for employment. Probably every civilized nation has filed away, through its war department or board, plans for the conquering of each of the neighboring countries, so complete that on a day's notice they can be set into operation. Similarly, a city's engineer or board of public works can prepare and keep up to date plans for doing work of the character referred to, providing for using any number of men, from five to five thousand, in either winter or summer.

With such a reserve of public work, there should be no excuse for unemployment and much less of public funds or private benevolence would need to be spent in charity and correction work, while the discontent of labor should be greatly reduced.

# MOSQUITO CONTROL FOR THE MUNICIPALITY.

## Draining Wet Lands, Pools and Other Places To Prevent Breeding—Clearing Out Channels and Denuding Shores—Filling in Low Spots—Methods of Operation and Approximate Cost.

BY W. A. HARDENBERGH.
Assistant Sanitary Engineer, U. S. Public Health Service.

There are two main reasons for mosquito-control work. The first is from the standpoint of public health; the second from personal comfort and to increase property or land values. These motives will be uppermost according to the location of the community, as within or without the malaria belt. The accompanying map, published by the Public Health Service, shows those regions of the country in which malaria is prevalent. But the mosquito is universal. From the equator to the far north, he—or rather "she," for only the female mosquito bites—is one of the inveterate enemies of man-kind. In practically every locality there is a mosquito problem.

Within the past few years many communities have taken up mosquito elimination work from one or the other of these reasons. Before the war, New Jersey, through local agencies, as counties and cities, was spending annually large sums of money in doing away with this winged pest, though in New Jersey the problem is one of comfort and financial return, rather than health. Likewise, in the South many cities had instituted anti-malarial work as a part of their health work. But with the intensive anti-malarial and anti-mosquito work that the government, through the Public Health Service, carried on during the war to protect the health of the soldiers in the cantonments, many more communities have visioned the possibilities and profits of mosquito elimination work. A large number of those places where this work was carried on during the war at governmental expense, are now providing local funds to continue and maintain the work, while other cities, seeing the advantages from advertising, health and financial viewpoints, have also set aside money for inaugurating such campaigns. To many of these places, the government, through the Public Health Service, is supplying aid by furnishing sanitary engineers and other trained personnel, whose salaries are paid by the government. Summer and winter resorts and industrial centers have been prominent among the cities quick to see the immediate returns sure to follow such a campaign.

### THE PROBLEM.

Though there are many species or kinds of mosquitoes, they all have certain points in common and the same control methods may be applied to them all, with minor exceptions. The malaria mosquito, *Anopheles*, breeds less widely than some of the other groups and consequently its control may be accomplished at a cost somewhat less than that of the others. *Culex*, the ordinary house mosquito, breeds in almost any sort of standing water, including sewage, in which it differs from *Anopheles*, which is found only in comparatively clean, clear water. *Aedes sollicitans* is a product of the salt marshes, mainly, while *Aedes calopus* breeds in rain barrels, tin cans, and water tanks near houses.

*Anopheles*, as has been stated, is the carrier of the malarial parasites. *Culex*, while a pest and a hard biter, is not so important a carrier of disease, though in warmer countries it transmits filariasis and in our own climate is said to carry dengue fever. *Aedes sollicitans* is not a carrier of any disease, so far as is known. *Aedes calopus* is the yellow fever carrier, but as the yellow fever germ is practically non-existent in the United States, the danger is now more academic than real provided no cases are introduced from without. There are several species of *Anopheles*, some of which are not important carriers of malaria, but no attempt will be made here to describe them at length. For those seeking more complete data, reference is made to the publications of the Public Health Service, where much detailed and valuable information will be found.

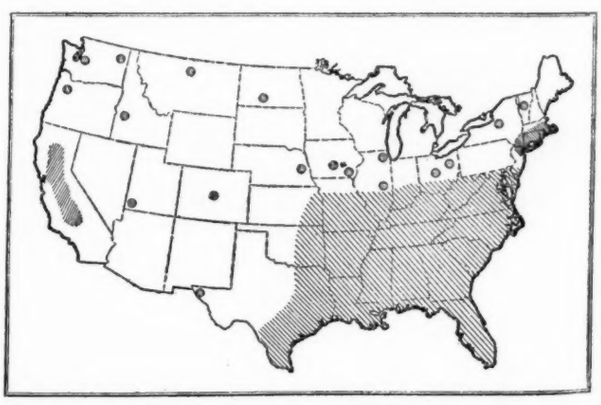
The maximum flight range of the mosquito is, roughly, about a mile. While some mosquitoes will travel further than this in small numbers ordinarily, or when favored by winds, in large numbers, elimination of breeding and sheltering places within the one-mile limit can be relied upon to limit the numbers of mosquitoes to a scarcely noticeable point. An exception may be noted in the case of *Aedes sollicitans*, where, with favoring strong winds, large numbers may occasionally travel for as much as twenty or thirty or more miles.

In the development of the mosquito, water is necessary for the first eight to fourteen days. The mother mosquito lays the eggs on the surface of the water. In 24 to 36 hours, these hatch out into larvae ("wiggletails"), which after seven to ten days turn into pupae ("tumblers"). In another thirty-six hours, the pupae issue as adult mosquitoes and fly away looking for their first meal of blood. The larvae of *Anopheles* can be identified by their position in the water, for they lie parallel to the surface, breathing through their tails, while the other larvae, though they breathe in the same fashion, lie at an angle to the surface. There are also differences between the pupae, though these differences are not so readily detected. The various adults can be recognized with ease. *Anopheles* when resting appear to be standing almost on their heads and their legs stick up in a distinctive fashion; their wings have spots, the number and location varying with the species to which they belong. The salt water mosquitoes are usually striped on the legs and beak. *Culex* have wings veined, more like those of a fly, and take a hunch-backed position while resting.

Water being a necessity for the first eight days or more, the problem of mosquito control becomes one of the elimination or control of such water as may breed mosquitoes. Standing water in the one-mile zone must be drained, filled, oiled or otherwise treated so that the mosquito will not breed in it.

Roughly speaking, mosquito control methods include two classes of work. One falls within the province of the sanitary engineer and consists mainly of ditching and drainage, filling, oiling, management and administration. The second is adjunct to the first and includes inspections of water containers, gutters, tanks, troughs and similar possible breeding places and their elimination as mosquito producers. This work may be combined with the general sanitary inspections already regularly carried on by many city health departments. It is with the first mentioned kinds of work that this article will deal mainly.

Before starting the work, a complete survey should be made of the area to be drained and the results of this survey, with data as to the importance of the breeding places found, should form the basis of the plan. In the case of the city, sufficient maps and surveys may be available for the preliminary work, when supplemented by a thorough inspection of the ground, so that a comprehensive scheme of work may be laid out at once. A map drawn to a large scale—400 to 600 feet to the inch—is a practical necessity. Completed work may be plotted on this map or on blue-prints or tracings made from it, thus giving a graphical record of the progress of the work.



ENDEMIC AREAS OF MALARIA IN THE UNITED STATES.
Shaded Circles Represent Localities in Which Cases of Malaria Occur and in Which the Disease is Probably Endemic.

DRAINAGE

The actual work of mosquito control is simple in most cases. In the construction of ditches, slopes should be such that, while there will be no standing water when the flow is small, the velocity, when they are running full, will not be so great as to cause erosion; curves of large radius should be used where possible; the section should be such as to minimize flood damage or choking from weed growths. Other work will include the cleaning of roadside ditches; lowering and cleaning culverts; ditching springs and seepage areas; cleaning and denuding pond and lake edges; cleaning and training streams; and filling low places.

Ditches for drainage work should not be too large, for this increases both first cost and maintenance. It should be borne in mind that eight days is the minimum time in which a mosquito can develop and that the time is usually several days longer, so that a ditch large enough to drain an area in four or five days is ample, even though rains occur at less than week intervals. Ditches having a V-shaped section with the bottom slightly rounded will stand up better and require less maintenance than those with vertical sides. The narrow bottom has an additional advantage in concentrating the flow in a constricted space and reducing isolated pools where the amount

MAINTENANCE GANG CLEANING OUT OLD DITCH.

TYPE OF DITCH BEST SUITED TO MARSH OR WET LAND DRAINAGE

of water carried is small. For this reason, where a large ditch is necessary, a smaller one, "one shovel wide," should be dug in the center to carry the dry-weather flow.

In soils where heavy rains do not wash or fill, open ditches will be satisfactory and cheaper. These will have to be cleaned at least twice a year, probably oftener in the Southern states where vegetation grows more rapidly. They should have attention just after the spring floods have subsided and again later in the summer, when the weedy and other growths should be removed. Tile drains or lined ditches may prove more economical in some localities, though the first cost be greater. Quite frequently property owners will contribute to the work to the extent of buying the tile, in preference to having an open ditch through their property. Tile drains may be laid at the usual grades for storm sewers and should have "sink-holes" of broken stone, brick bats, etc., located over them at frequent intervals to carry off standing or surface water.

BEFORE AND AFTER CLEANING EDGES.
Above, a Paradise for Mosquitoes; Below, Not a Menace or Mosquito Producer.

In more outlying regions or where something less costly than the tile drain but better than the open ditch is desired, a lined ditch may be used. These are especially desirable where, because of washing, maintenance costs may be heavy. Tile of the required size may be split lengthwise and laid in the bottom of the ditch, the ends being cemented together. Damaged or poor quality of tile may occasionally be used at a saving. A reinforced concrete lining is also possible at a low cost. A strip of chicken-wire netting furnishes the reinforcement and the concrete lining is placed as desired in the bottom and as far up the sides of the ditch as may be considered necessary. Caution in the use of this type will be necessary where frosts are severe and heaving common.

While it will not be possible in this article to enumerate and describe the many problems that may come up, a few of the typical cases will be described and the plan of procedure outlined. Where possible an estimate of the cost of the work will be given, but local conditions vary to such an extent that these costs can be considered only as approximate. In the consideration of costs, it must be borne in mind that in the examples given, men were paid at the rate of $2.50 per day and foremen $4.

Meandering small streams with occasional pools of dead water are frequently quite prolific producers of mosquitoes, both *Culex* and *Anopheles*. These are best treated by cutting brush along the stream channel and for a couple of feet back from the edge, and straightening and cleaning the channel. This will eliminate the pools. The water level can be lowered by ditching the high places and this will produce a stronger and more uniform flow. As few mosquitoes will breed in running water, this work will be effective as long as the channel is maintained in good condition. This work is not costly and a fair estimate of treating the average small stream is $50 to $100 per mile. When estimating stream length from a map, the

windings and turnings should not be ignored. A good rule is to multiply by three the map length of the stream to secure the actual winding field distance.

Larger sluggish streams, such as the bayous of the South, may be treated by removing the log jams and other obstructions and debris holding back the water. This will reduce the water level by several feet, thus lowering the water to mud banks. The final treatment is to clean and straighten the channel and allow a free flow for the water. Animal or hand-power or dynamite may be used in removing the logs and other drift from the streams.

Swamps are usually quite heavy producers of all the fresh-water varieties of mosquitoes. Though the great majority of swamps do not present very difficult drainage problems, exceptions are at times found. Not infrequently, in the South, the value of the timber made available by drainage may pay a substantial part of the cost of draining. In many cases, if an adequate outlet is provided, the swamp will drain itself. When the water has run down, the ditch should be deepened and extended through the swamp and to the feeders. In this work, where the ground is soft and may have tendencies toward sliding, wide shallow ditches should be used, or the sides of the ditches may be braced or retained by saplings.

Where a large part of the water supply of the swamp comes from seepage water oozing from the bases of surrounding hills or ridges, the above treatment will accomplish little. The central ditch has only a local effect and it will be necessary to construct an intercepting ditch around the toe of the hill, thus cutting off the swamp feeders and carrying the water out to the main ditch. The drawing herewith shows graphically the method of ditching where this type is encountered.

Closely connected with this problem is the question of seepage outcrops on hill-sides. These can best be treated by cutting small collection ditches along the hill at the point of outcrop and carrying away the water thus collected in main ditches. These collection ditches should generally follow contour lines, but should have enough slope to insure a good flow. An important point is to follow the seep to the point of real issuance from the underground strata.

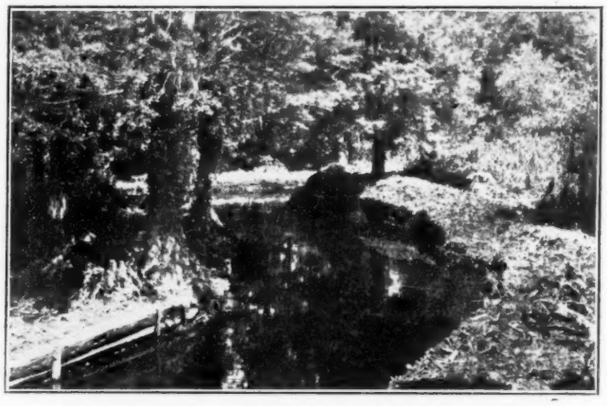
It is not possible to give an accurate idea as to the cost of ditching work of this kind. The size of ditch, kind of soil and other local conditions enter too largely into the cost to make an estimate of any value.

### REMOVING VEGETATION.

Where a body of water that cannot be drained economically is producing mosquitoes, the banks may be denuded and all vegetation removed for a foot above the water line. This method of control can also be applied to rivers, where the flow is sluggish and the rise and fall small. In this work, the main value of the treatment lies in having a sharp and grassless edge, so that there will be no hiding places for the larvae. Even if there are few minnows, so that fish control cannot be relied upon, this method, especially when supplemented by oiling at seven-day intervals, will be very effective. If the banks are steep and the water fairly deep, work can best be carried on from a boat or raft. In this case, all tools should be fastened by stout strings to floats or to the boat to reduce losses. Axes, bush-hooks, hoes and shovels are the best tools for this work.

RESULT OF CLEANING LOGS AND OTHER DEBRIS FROM CHANNEL.

Lowered Water Level Prevents Breeding. Original Water Level Shows at Tree Bases.



BEFORE AND AFTER CLEANING CHANNEL.

Removing Brush and Taking Advantage of All Available Fall.

Heavy hoes, which have weight enough to chop small roots with, and which do not break easily, are much superior to the ordinary hoe found in most hardware stores. The cost of this work is comparatively slight, usually running about $25 to $35 per mile of shore line. The same caution applies to this work as to stream channeling when computing lengths from a map, as the estimate will usually run considerably short of the actual distance.

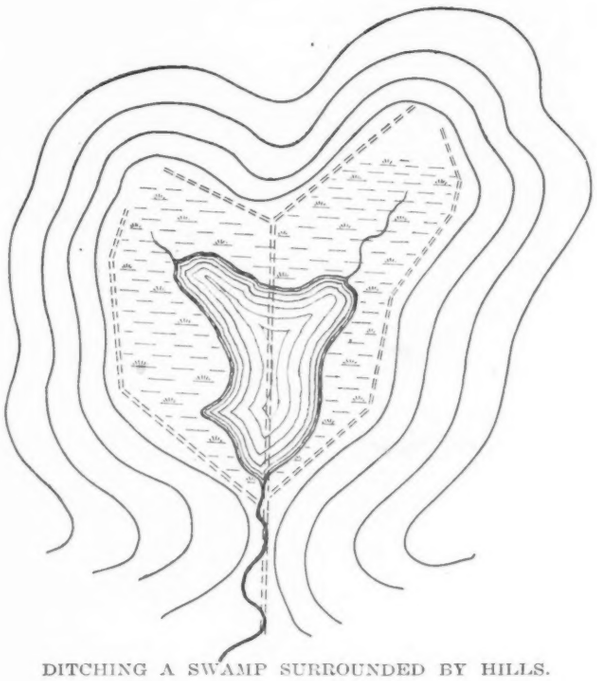
In many cities it will be found that roadside ditches and gutters will be large producers of mosquitoes. In the case of the deeper ditches or gutters, the remedy is to clean and remove all obstructions to the flow, so that after a rain there will be no standing water. The roadside ditches can be cleaned cheaply and easily with a ditcher or road machine. Grass and weeds should be removed and a clean, sharp ditch left. An occasional low place will do little damage if all protective covering is removed, as mosquitoes will rarely breed in these open pools where there is no cover. Moreover, the sun and wind will usually dry up such pools in less than a week.

A trip with a road machine or ditcher over these roadside ditches early in the spring and again later in the summer, removing grass and weeds and leaving a clean ditch, will not only remove mosquito breeding possibilities, but will keep the ditches in better shape for performing the work for which they were intended. The cost is small. Making two trips over each ditch, the cost will be about $25 to $40 per mile per ditch or twice this per mile of road.

### DITCHING WITH DYNAMITE.

The use of dynamite as a labor, cost and time-saving agent is worthy of consideration. Dynamite is especially valuable in ditching in soft mud areas, in swamps where roots, vines, brush and mud make hand ditching costly, in underwater work, and in clearing logs and debris from watercourses. Though its use is limited mainly to localities where there is a saturated soil, it is a valuable and reliable agent, where it can be used. The cost of ditching with dynamite is about two-thirds the cost of hand ditching, but its chief value is as a time saving element. Three or four men with dynamite can do the work of many times that number of hand ditchers.

With competent handling, ditches of almost any size or depth can be blown. Fifty per cent or sixty per cent straight dynamite is generally most satisfactory and cheapest for this class of work. This can be exploded by the "propagation" method from one stick fired by cap and fuse in the middle of



DITCHING A SWAMP SURROUNDED BY HILLS.

a long string. Firing by electric current is highly satisfactory, but more costly; much time is lost in arranging and fixing connections.

For ditches 2½ to 4 feet deep and 2 or 3 feet wide, a single row of sticks spaced about 18 inches apart can be used. The charges may be placed 18 to 24 inches in the ground and the firing done in sections of 100 feet at a time. For wider ditches, two or more rows, staggered, may be used. Deeper ditches can be blown by using relays. For under-water excavating, removing log jams, deeply imbedded logs and debris from stream beds, dynamite is also very valuable. In all dynamite work, an expert should be employed. It is far best to secure from the dynamite company the services of a competent man; such a man will pay for himself several times over, even on a small job.

### FISH CONTROL.

In addition to the methods of control by drainage, fish control may be a valuable aid at times. In the case of a lake or pond used as pleasure resort or for industrial purposes, drainage may not be possible, while cleaning of the edges and oiling may be impractical from financial or topographical reasons. It may be possible, though, to raise the water level of the lake two or three feet early in the spring. By keeping the water at this height till May or June, the inundated strip of vegetation along the shore will be killed. When the water level is lowered to the normal stage, this dead vegetation will not furnish hiding places for the larvae. Consequently top-feeding minnows will destroy them and breeding will be small. When fish are not present, they may be transplanted from another lake or secured from government or state fish hatcheries. Only the top-feeding minnows —Gambusia, Killifish, etc.—should be introduced. Success of this method of control will be indicated by the absence of pupae and of full-grown larvae, though partly grown larvae may be found.

### OILING.

Oiling and the kindred measures, such as the use of larvacides or of a creosote spray, may, in general, be regarded as temporary and costly, though extremely valuable measures. In those sections where suitable oil is produced and may be secured at a low price, municipalities may find it cheaper to oil some areas than to treat them permanently. In every case there will be some few areas that are almost impossible to handle any other way, but economy dictates that these shall be reduced to a minimum. In this connection, filling will be found very valuable. It has, also, the advantage of permanency with no cost for up-keep.

The best way to apply oil is by the knapsack sprayer, though drip-cans may be used to advantage in many places, especially on flowing streams. Oiled sawdust and the like have proved to be very valuable under certain conditions. The use of niter cake as a larvacide is possible in treating water in small containers, as in rain water barrels, fire storage tanks, etc. Niter cake will inhibit breeding for about four months after a single treatment. Other local products may occasionally be found that can take the place of costlier imported products.

### INSPECTION AND MAINTENANCE.

In every kind of mosquito control work the ultimate test of the value of the work, at least in the popular mind, will be the presence or absence of mosquitoes. To keep in close touch with the production of mosquitoes and the localities producing them is important and strict inspections should be made of the entire zone at weekly intervals during the summer months. When combined with the data obtained by catching adult mosquitoes wherever possible and the breeding out of larvae, these inspections should show the locations producing mosquitoes. On this work, a good inspector is a prime essential.

The organization to carry on a campaign of this sort for a city of about a hundred and fifty thousand population is not necessarily large, nor will the work be very costly unless the local conditions are of an extraordinary character. In addition to a well-trained engineer directing the work, there should be twenty to thirty laborers, divided into two gangs, each with a foreman. If more men be employed, a general foreman may be needed. The equipment will include a light truck and the necessary tools for this number of men, as axes, hoes, mattocks, bush-hooks, picks, and long-handled, round-pointed shovels. The man in charge of the work should be furnished with transportation.

POND CONTROL BY DENUDING AND CLEANING EDGES.
With Supplementary Oiling When Necessary, This is Very Effective and Not Costly.

For the maintenance of the work, once the actual construction has been completed, a much smaller force will suffice, perhaps not more than five or six men. In the early spring, when the entire system is in need of cleaning and general maintenance work, it may be economical to employ a larger number for a few days, while putting the work in shape for the summer. A good and reliable foreman is a necessity and when one is found, he should be retained. It will also usually pay to retain the men from year to year, employing them otherwise during the winter months, if necessary.

AID BY CITY ENGINEERS.

While not every city in the country is yet able or willing to inaugurate an anti-mosquito campaign, the engineer can prepare for the coming day in many ways. In looking over the conditions around his own city, he cannot fail to be impressed by the fact that many of the most prolific mosquito-breeding areas are man made. Railroad and highway construction borrow-pits are among the most common breeding places for all classes of mosquitoes and are difficult to correct. Fills without drains have cut off small areas and formed stagnant pools, ponds or swamps. Culverts are frequently too high, backing up water, or too low, allowing small pools to collect under them. All these and many other similar faults are remediable now only at a great and disproportionate expense. The engineer should scrutinize carefully all new plans for similar improvements and should insist upon the modification of those features which offer similar opportunities for similar nuisances.

Even the present day catch-basin, for example, offers an almost unexampled opportunity for producing mosquitoes, though the main product will be *Culex*. About the only way to prevent breeding is to oil at weekly intervals. A small bag filled with oiled sawdust and suspended from a wire may be used instead. Such an arrangement will need less attention, but the sawdust should be renewed about twice a month.

The cost of an anti-mosquito campaign and the resulting maintenance work is often surprisingly small. In many cases the cost has been actually less than the annual cost of house screening and screen repairs. In the malarial regions, the results from the standpoint of health are astonishing; in the matter of increased personal comfort and better living conditions, no estimate of the money value can be made; the increase in property values must also be considered.

It has been possible in this article to touch only a few of the salient points of the work, to give the municipal engineer and the progressive city official a view of the results possible of attainment and of the type of work necessary to secure these results. Very complete data on this subject in greater detail and covering a much wider range can be obtained from the publications of the Public Health Service. A list of these publications is appended hereto.

To associate sanitary engineer Harry R. Crohurst and assistant sanitary engineer A. W. Fuchs, of the United States Public Health Service, acknowledgement is hereby made for the advice and assistance rendered and the data furnished, as well as for various of the illustrations used. The publications of the Public Health Service have also been used freely in compiling the data herein given.

PUBLICATIONS RELATING TO MALARIA, AND MOSQUITO CONTROL.

**Public Health Bulletins.**

79. Impounded Water. Surveys in Alabama and South Carolina During 1915 to Determine Its Effect on Prevalence of Malaria. By H. R. Carter, J. A. A. Le Prince, and T. H. D. Griffits. 1916.
84. Is Mosquito or Man the Winter Carrier of Malaria Organisms? By M. Bruin Mitzmain. December, 1916.
88. Malaria Control: A Report of Demonstration Studies Conducted in Urban and Rural Sections. By R. C. Derivaux, H. A. Taylor, and T. D. Haas.

**Reprints from the Public Health Reports.**

28. Prevention and Destruction of Mosquitoes. By Joseph Goldberger. July 17, 1908.
105. Antimalarial Measures in Farmhouses and Plantations. By H. R. Carter. December 6, 1912.
156. Malaria in North Carolina. By H. R. Carter. December 19, 1913.
160. Malarial Fevers. Prevalence and Geographic Distribution in Arkansas. By R. H. von Ezdorf. January 2, 1914.
170. Prevention of Malaria. Suggestions on How to Screen the House to Keep Out Effectively the Mosquitoes Which Spread the Disease. By R. H. von Ezdorf. February 27, 1914.
172. Malarial Fevers. Prevalence and Geographic Distribution in South Carolina, Georgia, and Florida. By R. H. von Ezdorf. March 13, 1914.
180. Malarial Fevers in the United States. By R. H. von Ezdorf. April 10, 1914.
186. Malarial Fevers. Prevalence and Geographic Distribution in Alabama. By R. H. von Ezdorf. May 1, 1914.
193. Malarial Fever. Prevalence and Geographic Distribution in Mississippi, 1913. By R. H. von Ezdorf. May 22, 1914.
217. Mosquitoes and Malaria. Report on a Short Trip in Eastern North Carolina. By Ch. Wardell Stiles. September 4, 1914.
244. Impounded Water. Some General Considerations on its Effect on the Prevalence of Malaria. By H. R. Carter. December 25, 1914.
248. Impounded Waters. Their Effect on the Prevalence of Malaria. Survey at Blewetts Falls. By H. R. Carter. January 1, 1915.
257. Impounded Waters. A Study of Such Waters on the Coosa River in Shelby, Chilton, Talladega, and Coosa Counties, Ala., to Determine the Extent to Which They Affect the Production of Anophelines, and of the Particular Conditions Which Increase or Decrease Their Propagation. By J. A. A. Le Prince. February 12, 1915.
258. Malaria Control. Drainage as an Antimalarial Measure. By J. A. A. Le Prince. February 19, 1915.
260. Control of Malaria. Oiling as an Antimosquito Measure. By J. A. A. Le Prince. February 26, 1915.
272. Anopheline Surveys. Methods of Conduct and Relation to Antimalarial Work. By R. H. von Ezdorf. April 30, 1915.
277. Malaria in the United States. Its Prevalence and Geographic Distribution. By R. H. von Ezdorf. May 28, 1915.
290. Anopheles as a Winter Carrier of Plasmodium. The Mosquito as a Prophylactic Indicator. By M. Bruin Mitzmain. July 16, 1915.
327. Tertian Malarial Fever. Transmission Experiments with Anopheles Punctipennis. By M. Bruin Mitzmain. May 12, 1916.
328. Demonstrations of Malaria Control. By R. H. von Ezdorf. March 10, 1916.
359. Anopheles Infectivity Experiments. An attempt to Determine the Number of Persons One Mosquito Can Infect with Malaria. By M. Bruin Mitzmain. September 1, 1916.
382. Malaria: A Public Health and Economic Problem in the United States. By John W. Trask. December 22, 1916.
463. Breeding of Anopheles Quadrimaculatus in Deep Water and at a Distance from Shore. By H. R. Carter. April 19, 1918.
464. Effect of Anopheles Punctipennis on Natural Conveyance of Malarial Fever. By H. R. Carter. April 19, 1918.
476. Malarial Control. By J. E. Sparks. July 12, 1918.
480. The Relation of the Railroads in the South to the Problem of Malaria and Its Control. By R. C. Derivaux. August 2, 1918.
491. Winter Hibernation of Anopheles Larvæ. By T. H. D. Griffitts. November 15, 1918.
493. Use of Dynamite in Antimalarial Drainage Operations. By J. K. Hoskins and W. E. Hardenburg. November 22, 1918.
495. Anopheles Crucians: Habits of Larvæ and Adults. By C. W. Metz. December 6, 1918.
500. Some Aspects of Malaria Control Through Mosquito Eradication. By C. W. Metz. Public Health Reports. January 31, 1919.

**Supplements to the Public Health Reports.**

11. What the Farmer Can Do to Prevent Malaria. By R. H. von Ezdorf. February 13, 1914.
18. Malaria: Lessons on its Cause and Prevention. By H. R. Carter. July 7, 1914.
32. Field Identification of Malaria-Carrying Mosquitoes. By Ernest A. Sweet. October 19, 1917.

Copies of any of these publications may be obtained by addressing the United States Public Health Service, Washington, D. C.

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# MONTEZUMA SEWAGE TREATMENT PLANT

## Some Unusual Features of a Small Plant—Itemized Cost of Earthwork, Concrete, Filter Media and Drains.

A sewage treatment plant for the town of Montezuma, Iowa, designed by Prof. J. H. Dunlap of the State University of Iowa and recently completed, contains one or two unusual features of interest.

The town contains a population of about 1,500 and the plant was designed for 2,000, assumed as the population twenty-five years hence. The plant consists of an Imhoff tank, siphon chamber, two intermittent sand filters and a sludge bed.

The tank is of the circular type, with an area of gas vent 23.6 per cent of the whole superficial area of the tank. This is a larger area than is found in most plants, but in view of the trouble that has been caused by too small vents and the extreme freshness of the sewage, liberal allowance for both scum and sludge were thought desirable.

The sludge storage capacity up to within three inches of the bottom of the inverted V beam forming the overlap for the vents is about 1.67 cubic feet per capita on a basis of 2,000 future population, and up to the slots is about 1.88 cubic feet per capita.

On the basis of 100 gallons per capita per day (which allows for ground water infiltration) with uniform flow

throughout the 24 hours, the settling period in the tank would be 2.42 hours while 1200 population is connected with the sewers, and 1.45 hours when 2,000 are connected; while if all the sewage be assumed to reach the plant in 18 hours, the settling period would be 1.82 hours and 1.09 hours respectively.

One important and rather new feature provided in this tank, is an 8 in. drain just below the sludge outlet. The flow line of this drain is such that the sewage may readily be drawn below the slots in case it becomes necessary to work upon the walls of the settling chamber. It has been found in actual operation of Imhoff tanks in towns of the size of Montezuma, that not infrequently the sedimentation chamber is allowed to become completely sludged up and thus transformed into a small septic tank. In order to clean out the sedimentation chamber, it has been found necessary to lower the sewage below the slots and then force the sludge down through the slots, carefully squegeeing the walls and sloping aprons.

Prof. Dunlap gives the cost of the plant on the basis of $4.00 for labor per day of ten hours until late fall, after which the same was paid for eight hours; and teams at $7.00 per day of the same length. The length of haul from the railroad siding to the plant was 1.3 miles, over a fair road with no upgrades. Superintendence, overhead and profit are not included.

**Earth Work**

| Type | | Estimated cu. yds. | Cost per cu. yd. |
|---|---|---|---|
| Filter beds | Slip work | 1060 | $0.47 |
| Siphon chamber | ½ slip and ½ hand | 187 | 0.78 |
| Imhoff tank | Hand before banks caved | 408 | 0.82 |
| Imhoff tank | After cave-ins with bracing | 408 | 2.70 |

Sodding berms of filter beds, $0.20½ per sq. yd.

**Cost of 1:2:4 Concrete, per Cubic Yard.**

| | In Cylindrical Walls of Imhoff Tank | In Siphon Chamber Includes only walls and footings; roof and floor omitted. |
|---|---|---|
| Cement, at 6.4 sacks per cu. yd. f. o. b. Montezuma ($2.28 per bbl.) | $ 3.65 | $ 3.65 |
| Hauling by team—to barn, 8½c., to job, 9c. | 0.18 | 0.18 |
| Sand, 0.45 cu. yd. at $2.65 | 1.19 | 1.19 |
| Gravel, 0.90 cu. yd. at $3.59 | 3.23 | 3.23 |
| Steel reinforcement | 1.49 | 1.59 |
| Setting forms and reinforcement | 2.93 | 2.18 |
| Mixing and pouring; heating sand, gravel and water | 1.98 | 1.65 |
| Total cost per cubic yard in place | $14.65 | $13.67 |

**Cost of Filter Sand and Gravel, per Ton.**

| | Filter Sand | Filter Gravel |
|---|---|---|
| Cost f.o b. sand company | $0.35 | $1.25 |
| Freight | 0.90 | 0.90 |
| Unloading from cars (mostly box cars) | 0.063 | 0.095 |
| Hauling by team 1.3 miles | 0.39 | 0.39 |
| Unloading from wagons | 0.022 | 0.022 |
| Leveling and spreading | 0.131 | .... |
| Total cost per ton in place | $1.86 | $2.66 |
| Total cost per cu. yd. | $2.78 | $3.59 |
| Total amount required for two beds | 1390 cu. yd. | 194 cu. yd. |
| Total required for sludge bed | 21 cu. yd. | 32 cu. yd. |

**Cost of 6 in. Vitrified Farm Drain Tile in Filter Beds.**

| | |
|---|---|
| Cost of tile per ft. f. o. b. Montezuma | $0.08 |
| Hauling by team 1.3 miles | 0.005 |
| Trenching | 0.039 |
| Laying | 0.01 |
| Graveling at $2.66 per ton and spreading at $0.04 per ft. | 0.44 |
| Total cost per ft. of trench | $0.574 |

**Laying 15-in. Vitrified Pipe Sewer Main, 1425 Ft. in Length.**

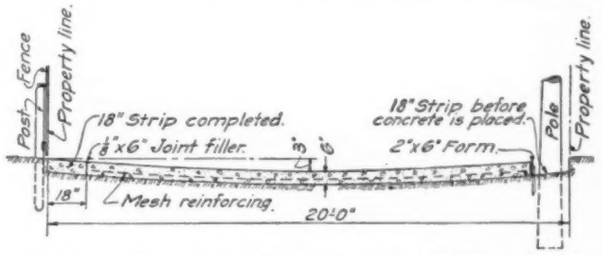
| | |
|---|---|
| Cost of pipe per ft. f. o. b. Montezuma | $0.65 |
| Hauling by team 1.3 miles | 0.033 |
| Trenching, including back-filling | 0.376 |
| Laying, including mortar | 0.077 |
| Total cost per ft. of trench | $1.14 |
| Cost of taking up old 15-in. sewer and back-filling per ft. | $0.246 |

## PAVING ALLEY WITH CONCRETE.

A method of overcoming some of the difficulties of paving alleys with concrete was worked out during the past year by Metzel & O'Hearn at Covington, Ky., and has been adopted as the standard for that city by H. G. Meiners, city engineer, and also by Joseph Herman, commissioner of public works, for the city of Newport, Ky.

The difficulties referred to were those of placing and finishing a pavement which extended entirely to the fences or buildings on each side in a continuous surface, securing a perfect flow line in the center (the alley pavement is dished), and meeting the further difficulty of poles set along the sides of the alley. It appeared impracticable to set side forms along the building lines, on which to slide a template, because there would be no place for the men to stand when striking off the pavement; the line of fences and buildings was quite irregular, some projecting over and others being back of the property line, while the concrete was to be carried into contact with each, and the telegraph poles would interfere.

These difficulties were met by setting the forms eighteen




CROSS-SECTION OF COVINGTON CONCRETE ALLEY.

inches inside the building lines (which were eighteen feet apart) and finishing the fifteen feet width in the usual way, the finishers standing in these 18-inch strips while striking off with the template and using the roller and belt. When this concrete was three days old the side forms were removed and the side strips up to the buildings were laid, with a pitch of one inch to the foot; a strip of ⅛-inch expansion joint material being placed between each side strip and the 15-foot pavement first laid.

The pavements were six inches thick, mixed 1:2:3, nominally eighteen feet wide with a 3-inch fall from edge to center. They were reinforced with wire mesh.

Besides the advantage as a construction method, this plan offers the additional one that when buildings are to be rebuilt or new ones erected, the pavement can be broken out to the expansion joint and a new strip laid when the building has been completed, instead of roughly breaking off the pavement and patching it.

## WATER SUPPLY FOR THE CANTONMENTS.*

### Use of Wood Pipe for Distribution Systems—Details of Joints and Other Special Features—National Guard and Embarkation Camps.

USE OF WOOD PIPE.

To most of the engineers the use of wood pipe was unfamiliar, and standard details were worked out for the laying of this pipe and especially for connecting it up with the cast iron pipes and specials that were used in connection with it. Ordinarily the manufacturers of wood pipe supply castings with bells designed to fit the tenons of their pipe. Approximately 1,000 miles of wood-stave pipe were laid by the Construction Division and it was impossible to secure a sufficient number of special castings and machine them to fit the several sizes of tenons.

When the first orders were placed for wood-stave pipe, the office was informed that it was common practice to lead the tenons of the wood pipe to standard cast-iron hubs as ordinary cast-iron spigots are leaded in, but the various camps began reporting that this seemed to be difficult or impossible. Many methods were suggested for making the joints, but the best was suggested by Mr. Ramsey, engineer at Camp Meade, and another engineer (name not given). The success of this method depended largely on having all the tenons made small enough to provide proper lead space, and on having the diameter of the tenons accurately standardized. The makers of the pipe agreed to make their tenons of a specified standard dimension. As an illustration, for the six-inch pipe the minimum inside diameter of the cast-

*Concluded from Page 228.

iron bell is 7.80 inches. For this size, the outside diameter of the wood pipe tenon was made 7½ inches. In order to make the joint, a cast iron plug was used which was 7 7/16 inches at the smaller end with a taper of 1/16 of an inch in 4 inches, the surface of the plug being smoothly turned. This plug was inserted in the cast iron bell and a lead joint poured and caulked lightly to insure a tight joint between the lead and the inside of the bell. The plug was then removed, leaving the lead in the bell. The tenon was then driven into the bell, having first been brushed with thin soft soap. If necessary, the lead joint was then caulked lightly. Where possible, the lead lining to the bell was prepared as above before the cast-iron pipe or fitting was lowered into the trench.

In his discussion, Major Clarence Goldsmith, hydraulic engineer with the National Board of Fire Underwriters and principal assistant to Col. Maury, said that in order to assure tightness of the system, it was absolutely necessary to leave the trench open temporarly with only a small quantity of back-filling replaced over the pipes between joints (to prevent the line from floating in case the trench became filled with water) and to keep the pipe line filled with water under little or no pressure for several days in order to allow the staves to swell. The line was then tested with a pressure about fifty feet in excess of the working pressure and all leaks which developed were stopped by inserting plugs or wedges. It was desirable to have at least one man experienced in laying wood pipe to direct the work and repair leaks. If the leaks are not stopped before backfilling, the escaping jet of water frequently formed a sand-whirl, which quickly cut the wire and caused the complete failure of a section of pipe. In one case the sand-whirl cut completely through a one-inch corporation cock.

Service connections of fir pipe, which has a thick stave, were made by inserting a corporation cock with a wood thread into a hole of slightly smaller diameter which had been bored with a bit. The thickness of shell of redwood pipe is insufficient to afford holding power in all cases, and saddles were used, wound onto the pipe, provided with thread to receive the thread of the corporation cock. Instructions were to bore the holes, in the wood-stave pipe and insert the cocks before laying the pipe, so that splintering the inner end of the hole might be avoided and augur cuttings removed. For 2½-inch service pipe a 1½-inch corporation stop cock was used, and for a ¾-inch service pipe a ⅝-inch stop cock was used. A reducing coupling was used to connect the stop cock to the service pipe. No lead goosenecks were used and experience has shown that they were not necessary, and the saving of material and labor thus effected was considerable.

In order to conserve steel, redwood tanks of 100,000 and 200,000 gallons capacity were used in most cases for storage. These tanks could be shipped from California within a few hours of receipt of order and could be erected quickly, and they cost much less per gallon of capacity than either steel or concrete.

The use of wood stave pipe is estimated by Col. Maury to have resulted in large saving of money, although it was made compulsory by the necessity of conserving steel and iron and because it could be obtained more quickly than these materials. Generally speaking, much of the pine pipe manufactured east of the Mississippi proved unsatisfactory and not so good as the pipe from the Pacific coast. Of the latter, redwood proved to be superior to fir, and air-dried wood superior to kiln-dried. "Having in mind the fact that experience proved that wood pipe of good quality, properly laid, showed very little leakage, and that the life of such pipe thus laid may safely be taken at about twenty years, it would have been wise, in the writer's opinion, to use this pipe for the camps, simply on account of the saving in cost and time of delivery, even had there been no restriction on the use of cast-iron and steel pipe."

NATIONAL GUARD AND EMBARKATION CAMPS.

Late in June, 1917, it was decided to construct sixteen tent camps for the National Guard troops, but by this time the orders for water works materials required by the cantonments had so exhausted the available stock and overtaxed the capacity of the various manufacturing plants that it was impossible for them to furnish any considerable quantity of similar materials within the time alloted. It was therefore necessary to use, if possible, materials that had not up to that time been drawn upon. It was decided to use six-inch wrought-iron steel pipe for distribution mains for eleven of these camps, six-inch cast-iron pipe for two camps in the Birmingham district and six-inch redwood-stave pipe for the two camps in California and one in New Mexico. The steel companies rolled and shipped 500,000 feet of six-inch steel pipe in a little more than six working days, and the cast-iron pipe manufacturers shipped about 80,000 feet of cast-iron pipe within a not much greater period; and a considerable part of the necessary material was on the way to the camps in practically all cases before any topographical maps of the camp site were available and in some cases before any quartermaster, engineer or contractor was on the ground.

The embarkation camps were designed with different sizes and groupings of buildings to a unit, and the typical layout of water mains was changed to suit these plans, the principal change being the use of three lines of mains instead of two through each unit. These camps were begun as the National Army and the National Guard camps were nearing completion.

As originally laid out the National Guard camps were designed to use tents, with no barracks and no sewerage systems. This meant that there was no necessity for providing the same standards of either fire protection or water consumption as for National Army camps, and an allowance of 30 gallons per capita was decided upon. The engineers anticipated, however, that there might ultimately be both barracks and sewerage systems, and the two lines of six-inch distribution mains running through each unit were laid along the outer edges of the units and in such manner that, when barracks were decided upon, the distribution system could be brought up to the requirements quickly by laying an additional main of larger size through the center of each unit.

Early in 1918 officers in charge of the Construction Division foresaw the probability of this change, but no official information to that effect was given out and no funds were available; but it seemed certain that when the orders did come the changes would have to be made in a hurry. With no appropriation and no authority the pipe could not be ordered, but the Division made its preparations by what might be considered a legitimate—and what proved to be a most fortunate—subterfuge. It placed an order for 300,000 feet of redwood-stave pipe of assorted sizes for the account of a large terminal project which had just been authorized and the funds of which were available. It was the intention to have this pipe actually shipped to this terminal and thereafter diverted, either in transit or by reshipment, to the various camps where it was anticipated it would be needed. In the meantime plans were prepared for reinforcing the distribution system and for such other changes in the camps as might be rendered necessary when the order came for converting them from tent camps to barrack camps. In August, 1918, the Construction Division was ordered to prepare immediately estimates of costs of such changes,

and these estimates were delivered within two hours. Practically none of the pipe that had been ordered went to the terminal, but it was diverted in transit directly to the camps. A very serious delay was avoided by this action of the officers of the Construction Division.

OTHER DETAILS.

Practically all of the regular service pumps used for the various supplies were motor-driven centrifugal. These were operated as a rule by purchased current. Not only were steam machinery and electric generators unobtainable—while electric motors and centrifugal pumps were obtainable on short notice—but the combination made the cheapest of all pumping units. At least one internal combustion engine was usually provided as a reserve against a breakdown in the electric service. Hub and spigot pipes and specials were used wherever possible in pumping stations instead of the flange pipe, which is ordinarily used, because the former gave greater flexibility for making connections, cost less and could be obtained more quickly.

In view of the size, character and distribution of buildings plenty of fire hydrants were provided so that there might be a large number of small streams with pressures sufficient to give good horizontal projection and so placed as to make it unnecessary to use hose lines longer than three hundred feet. The hydrant branches were made only 18 inches long and four-inch pipe used because of the reduced length. The hydrants contained two 2½-inch hose outlets. The nozzle tips were ⅞-inch in diameter. This combination provided a large number of streams quickly available through short lengths of hose and with first-class pressure.

In spite of the imperative demand for speed the sanitary quality of the supply was never overlooked, and in this the Sanitary Corps of the army and the Construction Division kept constantly in touch with each other, and when either noticed the slightest suspicion of danger of pollution it immediately informed the other and both united in a determined effort to remove it. Great care was exercised in selecting the sources of supply and in purifying the water wherever necessary; also all storage reservoirs were covered in order to prevent accidental or intentional pollution and the formation of algae. Chlorinators were furnished to all cantonments or camps even when the supply was considered to be normally safe. The use of wells in shallow strata, on inhabited watersheds, or in locations where it might be possible for the wells to become contaminated was prohibited. It was also prohibited to use any distribution mains for carrying polluted water for fire protection, industrial or any other uses, or to have in the cantonment any outlet or fixture from which such water might be drawn or any arrangement that would permit the later introduction of any such outlet or fixture. This last ruling was often difficult to enforce, but was always insisted upon.

In summing up, Mr. Maury stated that his office handled water supply problems on more than 275 different projects, involving the construction of about 1,100 miles of mains from six to thirty inches in diameter, 700 miles of service pipes from ¾ inch to 2½ inches in diameter, 650 million gallons per day in pumping capacity, 67 million gallons in capacity of concrete, steel or wood tanks, three billion gallons capacity in impounding reservoirs, and more than 40 million gallons daily capacity in filters. As to cost, he stated that the cost of reproduction new of an average water works system for a city of 40,000 inhabitants at present prices averaged more than $50 per capita, whereas the cost of water works of the cantonments, including service connections to within five feet of the buildings, has been less than $11 per capita, or about one-fifth as great. Possibly 25 per cent of this difference in cost is due to the use of wood-stave pipe instead of cast iron, the former costing about 60 per cent as much as the latter. Also the greater density of population in the camps aided in reducing cost; but when every possible allowance has been made the comparison is certainly favorable to the cantonment work.

Under the circumstances, however, time was even more important than cost; and with the most difficult material, labor and transportation conditions ever known in this country the water works for eighteen cantonments were planned and completed in a little over three months, while under ordinary circumstances three years would be required for planning and completing a water works system for a city of 40,000 population.

Practically all the engineers who engaged in the discussion of this paper paid high tribute to Colonel Maury and the part which he had played in securing the results of which the entire service was proud.

George A. Johnson was first in charge of the water and sewerage section of the Maintenance and Repair Division, and later was assistant to the officer in charge of that division; and he states that it would be natural to suppose that, given the condition of construction, there would be inadequacies, inapplicable features of importance and structural inferiorities which would show up in operation of the systems. He testifies, however, that the water systems in all of the military establishments were equal to the demands made on them, and that, although built in a mere fraction of the time usually required for such work and called on to function satisfactorily from the start, they did just that, and it was little short of a miracle that they did. As to the speed secured by the Construction Division, Mr. Johnson said that "probably no such aggregation of 'go-getters' and 'do-it-nows' was ever before brought together," and all labored unselfishly to serve their country first, last and all the time. Rear-Admiral F. R. Harris, located at Norfolk, described the difficulties that were encountered by the rapid and enormous development of Government work in that vicinity, one of the most serious of which was the water supply. Colonel Maury, as advisory engineer in general charge of the water supply development of the cantonments, was not responsible for any of this work; but Rear-Admiral Harris had been so impressed at a conference in Washington with his thorough knowledge of local conditions and his general efficiency that he advocated that this work be intrusted to the Construction Division of the army with the understanding that Colonel Maury was to give it his general supervision, and stated that the work was taken up by Colonel Maury and has been well carried out to his great credit and that of the organization of which he was the head.

## PAVING PRICES IN NEW ORLEANS.

Bids for paving twenty-two streets in New Orleans were received early in October. Five of these were for either wood blocks or granite; thirteen for either asphalts or bitulithic, and four for either gravel or chert. Comparing the lowest bids on each street, reducing the differences to percentages and averaging these, we find the following:

The prices for granite exceeded those for wood block by from 9% to 13%, averaging 11½%. The prices bid for asphalt exceeded those bid for bitulithic by from 2½ to 7%, averaging 4⅓%. Gravel was 2% less than chert in three cases and 24% less in the fourth.

## LEGAL NEWS
### A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

**Force of Special City Charter.**

(Tex. Civ. App.) Provisions of the city charter specially granted to city by Legislature have the same force and effect as any other positive statutory law of the state.—Cawthon v. City of Houston, 212 S. W. 796.

**Action to Enjoin Tax Bills—Contractor Interested Party.**

(Mo. App.) In owner's action to enjoin issuance of special tax bills for construction of pavement and delivery thereof to contractor, the contractor is the real party interested and a necessary party to the suit.—Wegenka v. City of St. Joseph, 212 S. W. 71.

**City Council Independent of Courts.**

(Tex. Civ. App.) A city council, when acting upon subjects over which it has the power to legislate, is an entirely independent lawmaking body, and cannot be interfered with or subjected to inquiry by the courts as to its motives, reasons, or purposes in enacting ordinances.—Houston Electric Co. v. City of Houston, 212 S. W. 198.

**Damage For Delay in Waterworks Contract—Final Estimate.**

(N. Y. Sup.) Where, on completion of a contract for construction of a portion of a waterworks system, the final estimate prepared by the engineers of the municipal water board stated that it did not include any claims which might be presented by the board direct, and made no provision as to damage for delay, which claim was presented by the board direct, held that the final estimate neither included such claim nor precluded the water board from offsetting it against the contract price.—People ex rel. Fidelity & Casualty Co. of New York v. Joslin, 177 N. Y. S. 42.

**Reasonable Public Use of Street—Franchise Rights.**

(W. Va.) A city acquiring a public street, acquires an easement for every kind of travel, and transportation which is reasonable and proper, and every other reasonable means of transportation beneath the surface, and reasonable use for wires of telegraph, telephone, and electric light companies.—Fox v. City of Hinton, 99 S. E. 478.

Right to use of city street for transmission of electric current for use of its inhabitants may be granted by city to public service corporation organized for that purpose, upon which such public service corporation will have same rights in streets for such purpose as city would have had, had it undertaken work itself.—Id.

**Bids on Void Specifications Are Void—Local vs. High Bidder.**

(N. Y. Sup.) Where specifications, on the basis of which bids for city contract were submitted, were void, the bids submitted were void.—People ex rel. Haecker Sterling Co. v. City of Buffalo, 176 N. Y. S. 642.

An action at law by the lowest bidder for city contract to recover damages, where contract has not in fact been awarded to him, cannot be maintained, except in those cases where by peculiar provisions of the charter the statute itself expressly confirms the contract to the lowest bidder.—Id.

The awarding of contract to furnish city with nine tractors for use in connection with flusher trailers in cleaning streets to manufacturer of the tractors then in use by city, for the purpose of securing standardization of parts, instead of to lowest bidder, whose tractor was assembled, was made in good faith and not arbitrarily.—Id.

That corporation bidding for city contract is a local industry, spreading a large pay roll over city, is not a sufficient reason for awarding contract to such corporation. instead of to a lower bidder.—Id.

In advertising for bids for city contract, the making of specifications which would exclude competition is a plain violation of the statute.—Id.

**Salary of Discharged Fireman.**

(Pa.) Where city fireman was found guilty by a fireman's court of charges preferred against him and discharged, from which action there was no appeal, and was thereafter reinstated by a similar court on rehearing of charges, he could not recover salary which would have accrued between discharge and reinstatement, as discharge terminated his employment, and as a subsequent re-employment was a new contract creating new duties and having no relation to former contract.—Winch v. City of Philadelphia, 107 A. 217.

**Prohibiting Moving of Garbage Through Streets—Police Power.**

(Mass.) Boston Revised Ordinances 1914, c. 40, § 14, providing that no person shall transport kitchen swill or garbage through the alleys or streets of the city, municipal collection and removal of the entire mass of garbage being necessary to preserve the public health, passed by the board of health under the authority of Rev. Laws, c. 75, § 65, is a valid exercise of police power by the city, justifying the refusal of permits to farmers to convey garbage and swill through the streets.—Wheeler v. City of Boston, 123 N. E. 684.

**Petition for Paving—Duty of Commissioners.**

(Tex. Civ. App.) Where a city charter made it the duty of the board of commissioners to order a street paved whenever the owners of 60 per cent. of the property abutting thereon should present a written petition therefor, and provided that assessment should be paid in five installments, and a petition for paving signed by the owners of more than 60 per cent. was filed, the board of commissioners cannot disregard it, and, acting under their general authority, order improvement and provide for payment of the assessment within 30 days after acceptance of the work.—Wooten v. Texas Bitulithic Co., 212 S. W. 248.

**Power of Mayor to Engage Private Detectives—City Liability for Contract for Services.**

(Idaho) Under Comp. Laws, § 148:60 (Sess. Laws 1913, c. 74, § 27), the action of council of Boise City, ratifying or attempting to ratify mayor's act in engaging private detectives to aid in prosecuting violation of ordinances and ordering claims for such services, was void.—Tate v. Johnson, 181 P. 523.

The mayor of a city governed by Comp. Laws, §§ 162:1—162:127 (Sess. Laws 1911, c. 82), the Black Law, or Commission Government Act, has no power to engage services of private detectives or aid in discovering and prosecuting alleged violations of city ordinances, in absence of authority granted by city council.—Id.

A city cannot be held liable under an implied contract for services, where power to make an express contract therefor is wanting.—Id.

**Power to Furnish Water Outside Municipality.**

(N. J. Ch.) Under Act March 27, 1917 (P. L. p. 429) art. 32, a municipality, as consideration for grant to it of a right of way for its pipe lines in another municipality, may agree to and actually furnish water to owners of tract through which pipe lines run, without consent of other municipality.—Town of Kearny v. City of Bayonne, 107 A. 169.

Act Oct. 11, 1907 (P. L. p. 677) J 2 does not forbid the obtaining of water by an inhabitant of a municipality from another municipality without the consent of the first municipality.—Id.

A municipality's contract to furnish water to owners of tract through which pipe line right of way and to make agreements necessary therefor, and furnishing of water under such contract is not a doing of a water business within Act March 27, 1917 (P. L. p. 438) art. 32, § 16, or Act Oct. 11, 1907 (P. L. p. 676).—Id.

Power in a municipality to furnish water to its inhabitants must be rested upon direct legislation.—Id.

The grant of power generally to provide a water supply for the inhabitants of a municipality does not carry with it the right to furnish water to inhabitants of other territories.—Id.

# MUNICIPAL INDEX

*(Continued from last week's issue)*

The Bear River Bridge. Proximity of old bridge; layout of work; under-water pile driving prevented interruption of work. By A. T. Macdonald. Paper before Engineering Institute of Canada. 2500 words. Canadian Engineer, Sept. 18, Toronto, Ont.

Concrete Ties Hold Together Walls of Bridge Approach Fill. On account of high ground on line of bridge, fill was not as great as showing face of thin outer walls used. 2 ills., 600 words. Engineering News-Record, Sept. 12, New York.

Highway Bridge Floor Replaced After Corrosion. Pottstown bridge over Schuylkill river a typical case of deteriorated floor system; new steel protected; lower chords open. 2 ills., 2200 words. Engineering News-Record, Sept. 18, New York.

**Other Structures:**

Extending Galveston Sea Wall. Two-mile addition to famous concrete protecting wall is being built with maximum use of mechanical aid. By J. B. Lippincott, consulting engr., Los Angeles, Cal. 7 ills., 1600 words. Engineering News-Record, Sept. 25, New York.

Preliminary Work for Construction of 1,000 Foot Concrete Arch at Montgomery, Pa. 2 ills., 600 words. Engineering and Contracting, Sept. 24, Chicago.

Viaduct Protected from Snowslides by Concrete Walls. Slides damaged tower columns in Cascade mountain gorge; bases of shore bents incased in concrete. By E. E. Adams, ass't engr., Great Northern Railway Co., Seattle, Wash. 3 ills., 1000 words. Engineering News-Record, Sept. 4, New York.

Concrete Wall Construction Is Continuous Process. Trenching, sheeting and bracing, piledriving, form-setting and concreting outfits move in procession. 4 ills., 1100 words. Engineering News-Record, Sept. 4, New York.

Wind Pressure on Cylindrical Structures in Practice. Methods applicable to various problems of structural designer in dealing with chimneys, stacks and standpipes; proportioning anchor bolts; guyed steel stacks. By R. Fleming, American Bridge Co., N. Y. C. 4500 words. Engineering News-Record, Sept. 11, New York.

Deflection of Continuous Beams and Rigid Frames. Tabulated factors facilitate computation of maximum deflection; approximation for unsymmetrical loading. By F. E. Richart ,engrg. experiment station, University if Illinois, Urbana. 3 ills., 1000 words. Engineering News-Record, Sept. 18, New York.

Fatigue Phenomena in Metals. Localized stresses under static loading and under impact loading; tests and criteria for fatigue strength; formulae for producing parts subjected to repeated stress. 1 chart, 4500 words. Engineering and Contracting, Sept. 24, Chicago.

## MISCELLANEOUS.

Town Planning in Eastern Canada. 47 municipalities in Ontario have already appointed housing commissions and applied for loans. From "Conservation of Life," published by Commission of Conservation, Ottawa. 700 words. Canadian Engineer, Sept. 4, Toronto, Ont.

Observations on Government Housing, and on Town Planning and Housing in General. 1600 words. Engineering and Contracting, Sept. 24, Chicago.

Scope of New Iowa State Housing Law. Summary of the provisions of the law. By Dr. C. W. Reese, state commissioner of housing. 1500 words. American City, September, New York.

Sanitary Association of Scotland. Annual congress at Perth. Present deplorable condition of housing in Scotland; discussion on disinfection; provision of water and drainage for housing schemes to villages in rural districts; salvage of town refuse. Sept. 11, 1200 words. Sept. 18, 1000 words. Municipal Engineering and Sanitary Record, London, England.

Protection of Owners on Cost-Plus Contracts. Practical use of Dewey decimal system in keeping books on the job; open for inspection by owners and their engineers and architects; distribution of accounts; classification of plant expense and field overhead. By F. A. Wells, vice-pres., Wells Bros. Constr. Co. of Canada, Ltd. 4 ills., 2500 words. Canadian Engineer, Sept. 24, Toronto, Ont.

The Kelley System of Payment to Contractors for Estimating. Definite schedule of charges; results of week's operation; weakness of system. From report of Committee on Methods of Asso. General Contractors of America. 2500 words. Canadian Engineer, Sept. 18, Toronto, Ont.

Suggested Form of Cost-Plus Contract. Cost plus unit profit insures contractor against loss and at same time protects owner. By G. H. Hailey, consulting engr., Cincinnati, O. 1500 words. Engineering and Contracting, Sept. 17, Chicago.

Cost-Plus-Fixed-Fee Contract. Building construction a huge gamble except under this form of agreement; co-operation for better building, plus greater speed and security. By A. E. Wells, pres., Wells Bros. Construction Co. 1200 words. Canadian Engineer, Sept. 11, Toronto, Ont.

Discrepancies in Tendering. No excuse for a two-to-one discrepancy; variation should not exceed 20 per cent; editorial. 550 words. Municipal Engineering and Sanitary Record, Sept. 4, London, Eng.

Awarding Contract to Informal Bidder. Editorial comment on the awarding of a contract to an informal bidder after formal bids had been opened. 200 words. Municipal Journal and Public Works, Sept. 13, New York.

Cost Keeping Under Cost-Plus-Fixed-Fee Contracts. Office routine of purchase order, invoices and voucher; distribution of accounts; classification of plant expense; field overhead. By F. A. Wells, vice pres. and treasurer, Wells Bros. Constr. Co. Chicago. 4 ills., 2700 words. Engineering and Contracting, Oct. 15, Chicago.

The Case Against Payment to Contractors for Estimating. Competition vs. Speculation; objections to "payment;" quantity expense real factor. By Wm. G. Smith, pres., Quantity Survey Co., N.Y. 2000 words. Canadian Engineer, Sept. 25, Toronto, Ont.

Contracts—A Comparison of "Cost Plus" with Other Forms. Paper before American Society of Civil Engineers printed in the Proceedings, by E. W. Clarke. 2500 words. Engineering and Contracting, Sept. 3, Chicago.

Municipal Markets. Open markets in 116 cities and inclosed markets in 56; incomes and expenses; officials in charge; structures and furnishings; rental charges; products sold. 1 ill., 3000 words. Municipal Journal and Public Works, Sept. 6, New York.

Municipal Markets. Products sold in the several markets; sizes of markets, rental charges in open and inclosed markets. (Concluded.) 900 words. Municipal Journal and Public Works, Sept. 13, New York.

Public Markets and the H. C. of L. Editorial reference to article in this issue on how several hundred public markets are run. 100 words. Municipal Journal and Public Works, Sept. 6, New York.

Drainage Works of the Rio Grande Irrigation Project. Elements of design, methods of ditch construction with dragline excavators on caterpillar tractors, and details of cost; over 15,000,000 cubic yards of excavation involved at cost of about $3,500,000. J. L. Burkholder, drainage engr., U. S. Reclamation Service, Denver, Colo. 4 ills., 3 tables, 6500 words. Engineering News-Record, Sept. 18, New York.

State and Federal Control of Land Drainage Needed. Control by districts does not meet larger problems; systematic study and high engineering ability required. By A. M. Shaw, consulting engr., New Orleans, La. 2000 words. Engineering News-Record, Sept. 11, New York.

Most Recent Developments in Methods of Measuring Irrigation Water to Farms and Irrigators. By F. E. Trask, C. E., cons. civ. and hydraulic engr. Los Angeles, Cal. 3 ills., 800 words. Municipal and County Engineering, September, Indianapolis, Ind.

Operation Methods and Results on Lindsay. Strathmore Irrigation District. Well tests and reconstruction; operation results of well and main pumping plants; water-hammer in wood pipe lines; repairs to steel pipes; gravity and pressure consumers' meters. By E. Court Eaton, supt., Lindsay--Strathmore Irrigation Dist., Lindsay, Cal. 5600 words. Engineering News-Record, Sept. 4, New York.

Cost of Irrigation Work for Maintenance and operation of Large Irrigation Project. By H. M. Chadwick, ass't chief engr., Valier-Montana Land and Water Co. 2 ills., 1700 words. Engineering and Contracting, Oct. 8, Chicago.

Engineering Standards Committee Proposes New Constitution. New draft provides for taking in other societies on equal basis; association plan for outside financing dropped. 2000 words. Engineering News-Record, Sept. 18, New York.

Present Status of Engineering Association Standards. Partial summary of progress which has been made in development of standards, recommended practices and miscellaneous methods and practices. "Buildings and Structures" and "Way Matters" by R. C. Cram; "The Wheel Situation" by H. L. Brown; "Mowing Weeds on Interurban Right-of-Way" by E. Main, chief engr., Rockford & Interurban Railway. 3000 words. Electric Railway Journal, Sept. 20, New York.

Municipal Engineers or Outside Engineers. Nothing short of sheer robbery for public bodies to take over a consulting engineer's report and plans and allow them to be carried out by their own surveyor. Letter to editor. 1100 words. Municipal Engineering and Sanitary Record, Sept. 4, London, Eng.

Problems Confronting Municipal Engineers. Supply of materials; labor difficulties. Excerpts from presidential address before Conference of Engrs. & Surveyors, at Newcastle, England, by C. Brownridge, boro engr., Birkenhead, Eng. 1000 words. Canadian Engineer, Sept. 4, Toronto, Ont.

Classification of Engineering Positions in State, County and City Service. 1000 words. Engineering and Contracting, Sept. 3, Chicago.

Industrial Viewpoint on Standardization. Experience of engineer who is user of electrical equipment emphasizes economies that come from fixing standards. By E. E. George, electrical engr., Chicago, Ill. 2500 words. Electrical World, Sept. 20, New York.

Municipal Forestry in Pittsfield, Mass. White pines are recommended despite the blister rust. By J. B. Woods, valuation engr., Treasury Dept. 3 ills., 2300 words. American City, September, New York

Portable Piledriver Has Many Uses. Perfected by Capt. A. M. Bellony, Engineers, U. S. A. 1 ill., 500 words. Engineering and Contracting, Sept. 17, Chicago.

Arrangement of Equipment in Engineer's Office. Adjustable table, lights and dictionary stand; special cases to protect instruments; generally neat appearance. By H. P. Farrow, C. E., Belfast, Me. 4 ills., 700 words. Engineering News-Record, Sept. 11, New York.

National Public Works Department Versus Corps of Engineers. Passage of Jones-Reavis bill urged on ground that great harm would result from injection of military system into activities of civil life. By I. Randolph, consulting engr., Chicago. 1500 words. Engineering News-Record, Sept. 18, New York.

Piece Work Versus Day Labor in Hand Excavation. Itemized costs of both. By E. N. Bryan, chief engr., Waterford Irrigation District, Waterford Cal. 2000 words. Engineering and Contracting, Sept. 17, Chicago.

Widened Channel Reduces Flood Hazard at Columbus. Scioto river set between earth levees 580 feet apart; over 200 structures wrecked for new $3,500,000 floodway. 2 ills., 1600 words. Engineering News-Record, Sept., 11, New York.

Fire Ladder in Surveying Work. 25 triangulation stations established, located near new boundary line of Baltimore. 150 words. Municipal Journal and Public Works, Sept. 27, New York.

Spanish Engineer Desires Municipal Reports. City Engineer of Barcelona endeavoring to secure copies of technical reports of American municipalities. 100 words. Municipal Journal and Public Works, Sept. 27, New York.

Unit Costs for Use in Public Utility Appraisals. Recent high prices increase differences in valuation already so divergent as to confuse courts; effect of choice of periods if average prices are used is important. By R. L. Baldwin, Burns & McDonnell, consulting engrs, Kansas City, Mo. 1 chart, 2600 words. Engineering News-Record, Sept. 11, New York.

What Can Be Done to Accelerate Municipal Improvement? Deflate currency and bank deposits so as to increase buying power of dollar and increase borrowing power of municipalities. 600 words. Engineering and Contracting, Sept. 3, Chicago.

*(Continued on page 248.)*

# NEWS OF THE SOCIETIES

**Nov. 12-14.**—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Springfield, Ill.

**Feb. 9-13, 1920.**—AMERICAN ROAD BUILDERS' ASSOCIATION. Annual convention, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau street, New York.

### Engineering Institute of Canada.

The three-day session of the fifth general professional meeting of the Engineering Institute of Canada was held at St. John, New Brunswick, Sept. 10-12.

One of the papers was read by C. O. Foss, chairman of the New Brunswick Water-Powers Commission, who outlined comprehensively the possibilities for hydro-electric development in New Brunswick.

Other papers and discussions included those on highway construction and bridge work, experimentation with high-tension, high-frequency electric current, engineering problems connected with the use of telephone cables, and heating problems produced by some of the modern methods of building construction. During the meeting trips were made to manufacturing plants and points of general engineering interest.

The sessions were presided over by the president Lieut. Col. R. W. Leonard.

### American Association of Engineers.

The American Association of Engineers recently issued the following "call to unity of the Profession."

"Unity of the engineering profession used to be desirable. Now it is a necessity, not only that the profession may retain its identity, but that it also may take the place in society which we think it should occupy. Unity can be accomplished, and that quickly, if we will but thoughtfully face the facts before us.

"The engineering profession today faces the danger of being submerged in the controversy between capital and labor. In its position between capital and labor the profession should be represented as a matter of course at the White House Conference in October. Any invitation that may be received will come, however, only on request, and the engineer who attends will be regarded only as an onlooker. We can have a voice and be heard only by presenting a united front.

"We say the engineer won the war. So must he win the battles of peace and take his part in the industrial readjustments where now justice, liberty and patriotism are swept aside in the struggle between capital and labor. As it is, organized labor seeks to divide the profession into the employer and employee classes. No calamity greater than this could befall the profession except to have it owned and at the behest of capital. The engineer's place has aptly been characterized as the third leg of the tripod on which modern industrial civilization rests. He belongs neither to capital nor to labor, but uses each for the purpose of accomplishing the greatest production for the happiness of mankind.

"If he uses capital and labor to produce for the enjoyment of all men, why should he not plead the case of the neglected major third party, the public, in the struggles climaxing in the steel strike?

"It can be done. Unity is close at hand."

The following resolution was drafted for presentation to the Board of Directors of the American Association of Engineers at its meeting on October 11.

Resolved—That the Board of Directors of the American Association of Engineers call a conference of representatives of all organizations or societies of engineers, architects and similarly educated or experienced technical men, for the purpose of strengthening the position of engineers and technical men as a group distinct from labor and from capital but essential to both and to society in general, because of the fact that stability of the social structure resting on the tripod of labor, capital and engineering, is dependent upon the strength of this third support.

# PERSONALS

Harry Barker and Robert C. Wheeler announce their association for the practice of engineering and the establishment of an office at 1512 Maiden Lane Building, 170 Broadway, New York City. Mr. Barker has recently been released from military service as Captain of Engineers, U. S. A., but Major Wheeler will remain in the service for a short time as Chief of the Water Supply Section of the Construction Division of the Army. Mr. Barker will be the active director of the firm's work until the release of Major Wheeler. Special attention will be given to public utility engineering, including valuations, rates, operation and management; to hydraulics; to power development and utilization; water supply and purification; sewerage and sewage disposal; municipal problems including city transportation and civic improvements; development of new processes; and reports for investors.

Mr. Barker is a graduate engineer (University of Vermont), with over fifteen years broad experience in electrical, mechanical and civil fields. His earlier work included design and testing of power plants, and field and laboratory work in hydraulics. For several years he was an editor of "Engineering News" and "Engineering News-Record." From the early days of the present form of utility regulation he has been consulted in public utility matters and much of his experience has been collected in the treatise "Public Utility Rates." In 1917 Mr. Barker was called from reserve to active military service, being assistant engineer depot officer at the New York Port of Embarkation, and an engineer of camp maintenance and utility operation in the Cantonment and Construction Divisions. After the armistice he was given leave to become associated with Mr. George W. Fuller, member of the Engineers' Valuation Board for the Pittsburgh Railways, which Board assisted the Pennsylvania Public Service Commission in the valuation of the 600-mile street and interurban railway system of the Pittsburgh District.

Mr. Wheeler is a graduate engineer (University of Vermont), who has specialized for ten years in the design, construction and operation of water supply and purification plants, sewers and sewage disposal works. His earlier work was in railroad construction. For over five years he was associated with Mr. George W. Fuller, being particularly identified with the water works and sewerage improvements at Clarksburg, W. Va., the sewerage and sewage disposal works at Vincennes, Ind., and those for Plainfield, North Plainfield and Dunnellen, N. J. Later he served a term as City Engineer for Summit, N. J., and then became General Manager and Chief Engineer of the New Chester Water Co., of Chester, Pa., and its subsidiaries, the Greencastle Water Co., Greencastle, Ind., the Vincennes Water Supply Co., Vincennes, Ind., and the Delaware Water Supply Co., Delaware, Ind. This office he resigned in August, 1918, when commissioned Captain in the Construction Division of the Army. He served as Assistant Port Utilities Officer at Newport News, Va., and in June, 1919, was promoted and assigned as Chief of the Water Supply Section.

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Wills, Wirt J., after having been chairman of the water commission of the Memphis, Tenn., artesian water department for six years, and general superintendent for the past seven and a half years, has tendered his resignation to take effect Nov. 1. Mr. Wills is patentee of the "Wills Pumping System" and will devote his entire time hereafter to the manufacture of these pumps.

Colony, S. E., Renovo, Penn., has been made borough engineer of Ridgway, Penn. He was formerly borough engineer for Renovo.

Browne, Charles A., of Orlando, Fla., division engineer for the state road department, has been appointed state highway engineer of Florida, succeeding William F. Cocke, resigned.

Gray, Harold F., former district health officer, Chico, Calif., has been appointed state sanitary engineer of New Mexico, with headquarters at Santa Fé.

Hartung, Paul, deputy county engineer of Jackson County, Missouri, has been appointed engineer of sewers, succeeding A. D. Ludlow, who recently resigned the former office.

# NEW APPLIANCES

**Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.**

## GAUNTT CHEMICAL FEEDER.

### For Continuous Treatment in Water Purification Plants.

The application of chemicals in water treatment by means of solution tanks requires much attention on the part of the operators and takes up space in the plant. Results, too, are not always satisfactory, because some chemicals are wasted and it is much harder to maintain the quality of water.

These difficulties may be eliminated by the use of mechanical feeding devices and mixers adapted to applying lime, iron, soda ash, etc., continuously.

The Gauntt feeders are made in two types—cylinder and conveyor—the former adaptable for feeding all chemicals in lump form, in sizes up to and including three inches in diameter and the latter for feeding all pulverized chemicals. The cylinder type is made in two sizes: 14-2 and 14-3, with capacities of 400 and 750 lbs. per hour. The conveyor type is made in three sizes: 4, 6 and 9, with capacities of 300, 800 and 2,000 lbs. per hour respectively.

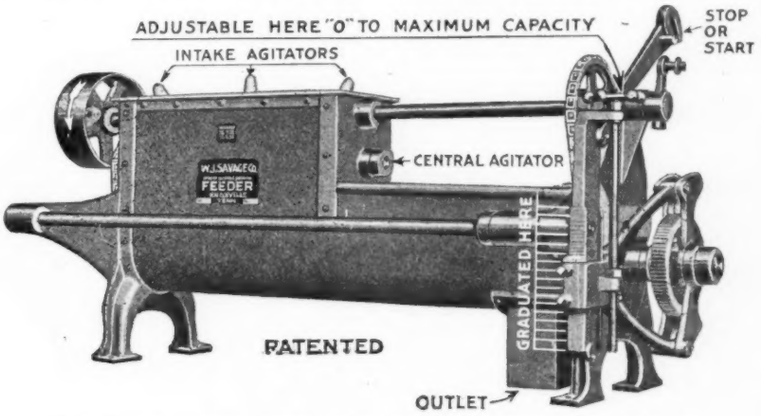
These feeders are adjustable instantly from zero to maximum capacity while in operation, and produce a steady and continuous flow of the chemicals. They may be operated by any suitable source of power.

The Gauntt mixers for iron, alum and soda ash are all alike, those for lime being of a different design. These mixers dissolve the chemicals without the use of mechanical stirrers and solution tanks. They are all equipped with steel hoppers and cast iron mixers to properly handle the chemicals for which they are intended. The hoppers are so designed as to prevent any choking or bridging over.

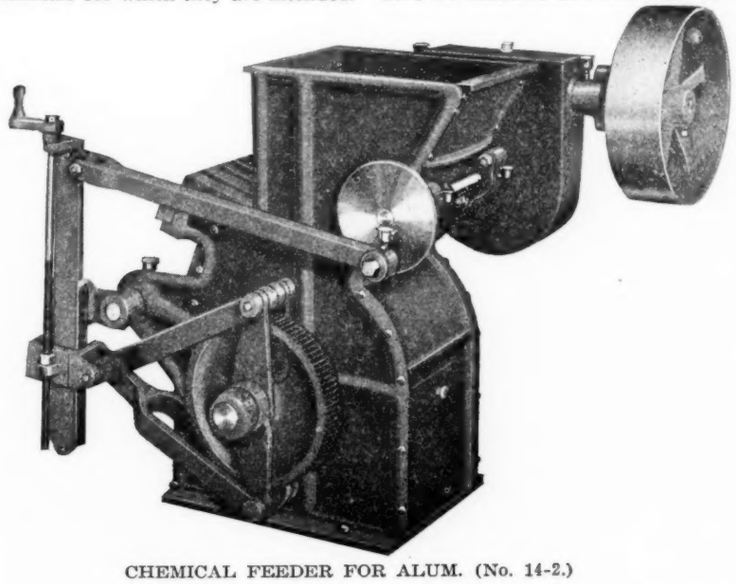
Feeding chemicals mechanically makes for more perfect control of treatment, with a better quality of effluent water resulting. Operation is more reliable and requires less labor and attention. Power and upkeep costs are also reduced. In some plants the elimination of unsightly tanks and the consequent saving of space are an advantage. Treatment is independent of temperature or velocity of water. Chemical feed lines are simplified. No agitators are required. It is estimated that the saving of chemicals will in many cases amount to over 10 per cent and the labor saving to 50 to 75 per cent, depending on the plant.

After a year's continuous operation of a Gauntt chemical feeder in the Knoxville, Tenn., water department, Jas. O. Crumbliss, commissioner, reports: "Before we installed this chemical feeder we were using tanks to dissolve the alum, and feeding the solution through an orifice. The tank system required a great deal of attention, was somewhat wasteful, and the orifice gave endless trouble. The chemical feeder is more compact, does not require any more power to operate, cuts down the alum bill and gives the operator more time to see after other things. It eliminates all trouble of dissolving the chemicals in cold weather, has an easy and positive control for various amounts of the chemicals required and also enables us to give the people a more uniform good quality of water."

The Gauntt feeders and mixers are made by the W. J. Savage Company, Knoxville, Tenn.




FEEDER FOR LIME, IRON AND SODA ASH (NOS. 4, 6 AND 9.)



CHEMICAL FEEDER FOR ALUM. (No. 14-2.)

## INDUSTRIAL NEWS

### Van Wie Pump Company Sold to the East Iron & Machine Company.

The Van Wie Pump Company of Syracuse, N. Y., successor to the Baldwinsville Centrifugal Pump Co., established in 1860, has sold its business—drawings, patterns, good will, etc., to The East Iron & Machine Co., Lima, Ohio. With this change the oldest centrifugal pump manufacturing concern in North America retires from the field. The business was established at Baldwinsville, N. Y., in 1860 and was first conducted by White, Clark & Company. Later, the name was changed to the Baldwinsville Centrifugal Pump Co. In 1880 the factory was removed to Syracuse, N. Y., and in 1905 it was incorporated as the Van Wie Pump Company.

The line manufactured includes vertical and horizontal centrifugal pumps, double suction pumps, sand pumps, hydraulic dredge pumps, single acting triplex pumps and vertical steam engines. It includes pumps suitable for,

and adapted to, every industry where pumps are used—contractors, irrigation, mills, factories, dry docks, water works, dredges, etc. Thousands of these pumps of various types are in use throughout North America, and are now operating in many of the largest plants and industries.

The East Iron & Machine Company at its plant in Lima will at once begin to manufacture the entire line, as well as make parts and repairs for all Van Wie products. It is also its intention to make improvements on several of the pumps, which will greatly increase their efficiency. Their engineers are now working on this.

Established in 1903, the East Iron & Machine Company has had a strikingly successful development. It builds Merriman Steam Melting Asphalt Plants and complete lines of machinery for chemical, food and allied industries.

### Railroad Administration Asks Cooperation.

Walker D. Hines, Director General of Railroads, authorized the following statement, asking the further cooperation of shippers and receivers of freight in promoting freight car efficiency:

"During the war, no one was more patriotically helpful than the American shipper. With zeal and efficiency he did his part in the common cause. The Railroad Administration had excellent opportunity to observe this attitude during the war and has appreciated heartily the subsequent continued cooperation of the great majority of the shippers. The time has now come for renewed efforts by both the Railroad Administration and the shippers and receivers of freight so that the nation's transportation service may be rendered with the greatest satisfaction possible under the circumstances.

"An unusually heavy grain and coal movement, deferred repair and the construction of public highways in all sections of the country and the concentrated requirements of suddenly reviving business, combined with the usual transportation requirements at this time of the year, threaten a serious lack of transportation facilities unless all parties interested cooperate in securing the greatest possible utility from the existing limited transportation facilities.

"The Railroad Administration will do its full part. The Car Service Section in Washington and the various regional organizations are striving earnestly to secure a fair and just distribution of the existing equipment as well as to meet the requirements of individual shippers. Of the 100,000 new freight cars which the Railroad Administration ordered constructed, 59409 had been completed on September 13, and are now in service, and this number is being increased at the rate of over 900 each working day. Instructions have been issued to all Regional Directors to bend every effort to speed up road and yard movements, to secure heavier loading equipment, to establish and maintain complete and accurate yard checks, to reduce the number of bad order cars, to make prompt delivery to connections, to effect early deliveries at freighthouses and teamtracks, to reduce the number of freight cars used in the transportation of company material and to expedite the movement of grain cars in terminals. The hours of labor of car shop employes have been increased and every effort is being made, both in railroad shops and in the shops of private concerns to whom the work is being let out, to reduce the number of bad order cars.

"Shippers of freight can assist.

1. By loading all cars to full visible or carrying capacity.
2. By prompt loading and release to the carrier.
3. By ordering cars only when actually required.
4. By eliminating the use of railway equipment in trap or transfer service when tonnage can be handled by motor truck or wagon.
5. By reducing the diversion and reconsignment of cars to a minimum.

"Receivers of freight can assist

1. By prompt unloading of cars and notice thereof to the carrier.
2. By ordering goods in quantities representing the full safe carrying capacity of cars and disregarding trade units.
3. By ordering from the nearest available source.
4. By pooling orders so as to secure full car load.

"A resumption of intensive loading will not merely reduce the number of cars under load but will also relieve congested terminals where it is a question of track room rather than of equipment."

### Asphalt Association Appoints New Engineers.

Walter E. Rosengarten has resigned his position as highway engineer in the United States Bureau of Public Roads to accept the position of traffic engineer with the Asphalt Association and will make his headquarters at 15 Maiden Lane, New York.

At his new post Mr. Rosengarten will deal with the very difficult and pressing problems of co-ordinating the design of the various highway types with the requirements of modern traffic. In specializing along these lines the Asphalt Association has shown its appreciation of the fact that the traffic of America's 7,000,000 motor vehicles including some hundreds of thousands of heavy trucks calls for a keen and appreciative study of the forces which on the one hand tend toward the deterioration of the highway and on the other hand toward increasing operating costs and the deterioration of the motor vehicle itself.

Mr. Rosengarten is considered particularly fitted for his new post by reason of the fact that since his graduation from the engineering department of the University of Pennsylvania he has had a combination of practical highway construction experience and research study with both the University of Pennsylvania and the U.S. Bureau of Public Roads. He was with the Federal Bureau about eight years during which he spent about four years in practical highway construction, about two and a half years in the research and testing division in connection with laboratory and field work.

Captain Robert B. Murdock, who has recently returned from military service in France, has been appointed executive engineer with the Asphalt Association. He will directly assist the secretary of the Association in developing the organization and operating policy.

Captain Murdock has had an extensive experience in practical highway work during the course of which, as resident engineer he had charge of the construction of one of the most difficult portions of the Columbia River highway including the famous figure "8" section at Crown Point near Portland, Oregon.

Later he was made assistant state highway engineer of Oregon and held that office until he entered the military service.

## MUNICIPAL INDEX

(*Continued from page 245.*)

Dutch East Indies Offer Many Construction Opportunities. Developments now under way or in prospect in Sumatra and Java include port works, railroads and water-power. By J. W. Evans, N. Y. C. 1600 words. Engineering News-Record, Sept. 11, New York.

Land Platting in Michigan. Abstract of paper at meeting of the Michigan Engineering Society, giving concise statement of general requirements for recording plats according to Michigan laws, with standpoint of owner, engineer and officials who handle assessments. By H. L. Brightman .Engineering and Contracting, Sept. 3, Chicago.

Canada Must Develop Her Great Fuel Resources. Dependence upon supply from United States is national menace despite best intentions of that country; international problem for engineers and statesmen. By A. V. White, cons. engr., Commission of Conservation of Canada, in address before Canadian Gas Ass'n. 4000 words. Canadian Engineer, Oct. 2, Toronto, Ont.

Overworking City Engineers. Editorial reference to action of Mayor of Seattle in recommending hiring a special engineer for Skagit power plant; city engineer a "general practitioner." 250 words. Municipal Journal and Public Works, Sept. 13, New York.

An Endowment Fund for "Boston Tech." A promise of $4,000,000 provided another $4,000,000 can be raised; editorial on the need of an endowment fund. 500 words. Municipal Journal and Public Works, Sept. 27, New York.

Analysis of High Cost of Living Problem. Report to Secretary of War Baker by Director of National Defence and summarized for information of Congress. By G. B. Clarkson, Washington, D.C. 1 chart, 5500 words. Gas Age, Sept. 15, New York.

Organization of a Laboratory for Industrial Research. Aims of a research organization; divisions of the laboratory. Abstract of paper before American Society of Mechanical Engrs., by A. D. Little and H. E. Howe. 2600 words. Engineering and Contracting, Sept. 24, Chicago.

School Building Program. Editorial reference to questions given out by Bureau of Education, Department of Interior, which must be answered before city can prepare school building program, properly planned. 200 words. Municipal Journal, Sept. 20, New York.

Erroneous Economic Articles in the Daily Press and How to Reduce Their Number. By H. P. Gillette, editor. 1500 words. Engineering and Contracting, Sept. 24, Chicago.

# ADVANCE CONTRACT NEWS

ADVANCE INFORMATION
BIDS ASKED FOR

CONTRACTS AWARDED
ITEMIZED PRICES

**To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.**

## BIDS ASKED FOR

### STREETS AND ROADS.

**Cal., Sacramento.** Nov. 17.
20 mi. grading on San Diego-Imperial road between Pine Valley and Tecate divide—State hwy. comn.

**Ga., Savannah.** Noon, Nov. 20.
Grading, draining and paving road from Savannah to line between Chatham and Effingham cos., including culverts, pipes, headwalls and drains, and scarifying, rolling and repairing, involving 17,457 lin. ft. road 18 ft. wide, 34,194 sq. yd. paving under fed. aid proj. no. 103, and 51,103 lin. ft. 15-ft. road, 90,840 sq. yd. pavement; also grading, draining and paving 65,637 lin. ft. 16-ft. road from Savannah to line between Chatham and Bryan cos., involving 116,688 sq. yd. pavement and 3 bridges—R. Butler, clk., co. comrs.

**Ga., La Grange.** Nov. 18.
13 mi. road between La Grange and co. line with concr. bridges and culverts, involving 117,000 lbs. steel reinforcing, 957.4 class A concr., 154.8 class B concr., 105 cu. yd. stone rip rap, 248 cu. yd. wet excav., etc. for 16 concr. bridges; clearing, grading, pipe, top soil, etc. on 3 projects, involving 19 acres clearing and grubbing, 1,650 lin. ft. vitr. clay pipe, 127 cu. yd. concr. headwalls, 111,668 cu. yd. earth excav. and borrow, 1,200 cu. yd. excav., 45,000 top soil surfacing, 10 mi. grassing slopes—Garrett & Slack, Bell bldg., Montgomery, Ala.

**Ga., Americus.** 10 am, Nov. 21.
3 mi. fed. aid proj. no. 102, 1-course concr., or bituminous macadam, or rock asphalt, or Willite asphalt, involving 31,880 sq. yd. pavement, 11,058 cu. yd. common excav., concr. in culverts and headwalls, 200.5 lin. ft. D. S. V. pipe, 1,017.8 sta. yds. overhaul, 31,880 lin. ft. 2x8-in. wood curb, etc.—Thomas & Hawkins, engrs, 302 Forsyth bldg., Atlanta.

**Ill., Piper City.** 1 pm, Nov. 13.
Grading, curbing, paving and draining various roadways, involving 10,082.9 cu. yd. excavating, grading, etc.; 24,185.7 sq. yd. brick blk. paving with sand filler, surface dressed with ½-in. compacted sand; 24,185.7 sq. yd. foundation for pavement of 4-in. concr. and cushion for brick paving of 1½-in. compacted sand; 1,504 lin. ft. protection stone on 4-in. gravel foundation; 5,424.7 lin. ft. combined curb and gutter on 6-in. gravel foundation; 28 cast iron curb inlets; 30 concr. catch basins; 1,081 lin. ft. 8-in. sewer pipe; 3,106 lin. ft. common red drain tile, 8-in. diameter, and 537 lin. ft. 10-in. red drain tile—Vil. clk., city hall.

**Ill., Springfield.** 10 a. m., Nov. 12.
State aid road work as follows: 3,250 ft. 16-ft. concr. road in Shelby co.; 2,500 ft. concr. 10-ft. road in Boone co.; concr. bridges in Hardin and McDonough cos. Also paving with portland cement concr., monolithic brick (4-in. or 3-in.), or bituminous concr. with or without binder course in following cos.: 25,600 ft. 8-ft. road in Vermillion co.; 41,475 ft. 18-ft., 29,676 and 40,109 ft. 18-ft. in Will and Grundy cos.; 25,415 ft., 15,830 ft. and 21,235 ft. 16-ft. roads in Macoupin co.; 19,672 ft. 16 and 18-ft. road in Madison co.; 19,307 ft., 23,864 ft. and 20,223 ft. 16 and 18-ft. road in Bond co.; also 13,460 and 8,369 ft. 19 and 30-ft. earth roads in La Salle co.—C. Older, chf. hwy. engr., state dept. pub. wks. and bldgs.

**Ind., Mt Vernon.** 2 p. m., Nov. 13.
14,044 ft. gravel road in Lynn twp., Posey co.—J. R. Haines, co. aud.

**Ind., Fort Wayne.** 10 a. m., Nov. 17.
16,012 ft. road in Wayne twp., Allen co.—A. C. McCoy, co. aud.

**Ind., Anderson.** 10 a. m., Nov. 17.
9,340 ft. concr. road in Lafayette twp. and 2,165 ft. concr. road in Van Buren twp., Anderson co.—E. T. Flahavin, co. aud.

**Ind., Lebanon.** 11 a. m., Nov. 19.
Gravel road on co. line between Hendricks and Boone cos.—C. Goodwin, aud., Boone co.

**Ind., Indianapolis.** 10 am, Nov. 12.
Grading and paving roadway of city street—Bd. pub. wks.

**Ind., Albion.** 2 pm, Dec. 2.
Road in Washington twp., Noble co.—H. C. Erwin, co. aud.

**Ia., Oskaloosa.** 8 p. m., Nov. 17.
Paving in various streets.—H. C. Hawkins, engr., city hall.

**Ia., Lean.** 8 p. m., Dec. 3.
10,000 sq. yd. paving with brick, rein. concr., sheet asphalt, asphalt concr., or bituminous concr., est. $150,000.—C. A. Shockley, 740 Reserve Bank bldg., Kansas City, Mo.

**Kan., Emporia.** 1.30 p. m., Nov. 26.
Section of fed. aid proj. no. 30 in Lyon co., 23,700 ft. in length, 18 ft. wide, 1-course concr., 2-course concr., monolithic brick, or bituminous filled brick on sand cushion with concr. base, as pavement, with 5 ft. earth shoulders on each side, etc., involving 16,406 cu. yd. earth, 47,400 sq. yd. paving, 639 cu. yd. corner in culverts and bridges and 25,823 lbs. reinforcing steel.—G. L. Miller, co. clk.

**La., New Orleans.** Noon, Nov. 24.
11.3 mil. Melville-Palmetto hwy. in St. Landry parish; 19.8 mi. Alexandria-Oberlin hwy. in Rapides parish; and 8.05 mi. Coushatta-Shreveport hwy. in Red River parish; also following sections of New Orleans-Hammond hwy.: 14.27 mi. from Pontchatoula to Maine; 18 mil. from Manchac to Labranch; 15.93 mi. from Labranch to West End, Tangipahoa, St. John the Baptist, St. Charles and Jefferson parishes.—Duncan Buie, state hwy. engr., 736 Maison Blanche annex.

**Me., Augusta.** 11 am, Nov. 19.
7.05 mi. state hwy. in town of Enfield, grading, draining and gravel-surfacing—P. D. Sargent, chf. engr., state hwy. comn.

**Md., Baltimore.** noon, Nov. 28.
State road in Faulkner—P. H. Zouck, chn., state road comn., 601 Garrett bldg.,

**Mich., Lansing.** 1.30 pm, Nov. 17.
Improving 6.443 mi. road in Tobacco twp., Gladwin co., consisting of shaping road drainage structures and gravel surfacing to width of 16 ft.—F. F. Rogers, state hwy. comr.

**Mich., Lansing.** 1.30 pm, Nov. 18.
Improving 8.068 mi. road in Arenac twp., Arenac co., by shaping road and surfacing to width of 16 ft. with gravel—F. F. Rogers, state hwy. comr.

**Mich., Lansing.** 10 am, Dec. 2.
Improving 48.503 mi. road in Powell, Champion, Ishpeming, Marquette and Negaunee city, Marquette co., by grading and drainage structures, involving 231 acres clearing; 34,385 sq. yd. grubbing; 474,327 cu. yd. earth, 81,610 cu. yd. loose rock, 5,132 cu. yd. solid rock and 21,778 cu. yd. ditch excav.; 89,202 lin. ft. guard rail; 1,667 cu. yd. retaining wall, (rubble); 63,231 lbs. steel reinforcement in culverts; 12,912 lin. ft. installing corrugated iron culverts, etc.—F. F. Rogers, state hwy. comr.

**Mich., Elba.** 2 p. m., Nov. 12.
Improving road in Elba twp., Gratiot co., by shaping, drainage structures, and surfacing with coarse gravel.—N. E. Brandt, hwy. comr.

**Mich., Lansing.** 10 a. m., Nov. 15.
Improving 4.324 mi. road in Baraga co., involving shaping subgrade to width of 15 ft. with one-course gravel.—F. F. Rogers, state hwy. engr.

**Minn., Crookston.** 2 pm, Nov. 24.
12 mi. fed. aid proj. no. 80, involving 13 acres clearing and grubbing, 37,993 cu. yd. excav., 33,431 cu. yd. haul, 1,398 lin. ft. 12 to 30-in. portable culverts, 48 rein. concr. culverts, and 14.229 cu. yd. gravel surfacing; 10 mi. fed. aid proj. no. 94, involving 82,774 cu. yd. excav., 86,516 cu. yd. haul, 326 lin. ft. 12 to 36-in. portable culverts, 12,000 cu. yd. gravel surfacing, etc; 1½ mi. fed. aid proj. no. 1913, involving 14,316 sq. yd. concr. paving and 14,320 ft. drain tile, all in Polk co.—H. J. Welte, co. aud.

**Mo., New Madrid.** 2 p. m., Nov. 12.
Grading, constructing pipe culverts, drainage wells and gravel pavement on 19.5 mi. state road from Sikeston to New Madrid in New Madrid co.—C. V. Hansen, engr.

**Mont., Helena.** 2 p. m., Nov. 20.
Grading, draining and gravel surfacing 3.6 mi. fed. aid proj. no. 15 in Rosebud co.; grading, draining and gravel surfacing, etc. 2.84 mi. fed. aid proj. no. 40 in Gallatin co. and one 50-ft. steel span over East Gallatin river; grading, draining, gravel surfacing, etc. 26 mi. fed. aid proj. no. 53 in Yellowstone co.—Chf. engr., state hwy. comn., Capitol bldg.

**New., Carson City.** Noon, Nov. 18.
16.67 mi. state hwy. from Lovelock to Zola, Pershing co., involving 40,000 cu. yd. excav.; 105,503 sq. yd. 5-in. gravel surface, 200 cu. yd. class A concr., 65 cu. yd. class B concr., 380 lin. ft. 12-in., 694 lin. ft. 18-in., 200 lin. ft. 24-in., and 100 lin. ft. 30 and 36-in. metal pipe, etc.; also 2.76 mi. state hwy. in Washoe co., involving 12,300 cu. yd. excav., 346 lin. ft. 15-in., 140 lin. ft. 18-in. 26 lin. ft. 24-in. and 28 lin. ft. 30-in. metal pipe, 35 monuments, etc.—C. C. Cottrell, state hwy. engr.

**N. J., Atlantic City.** 3 pm, Nov. 20.
Improving portions of streets, including dredging waterway and depositing dredging material on streets, involving 94,000 cu. yd.; setting 20,200 lin. ft. wood curbing, graveling 40,700 sq. yd. driveways and 12,800 sq. yd. sidewalks and 14,750 sq. yd. grass plots; constructing 350 lin. ft. terra cotta pipe culvert and 396 lin. ft. cast iron pipe drains—J. W. Hackney, city engr., 22 city hall.

**N. Mex., Santa Fe.** 2 pm, Nov. 25.
1.71 mi. Tijeras Canyon Cooperative Forest Aid proj., in Bernalillo co., involving 2,866 cu. yd. class 1, 545 cu. yd. class 2 and 517 cu. yd. class 3 excav., 2,741 cu. yd. class 1 borrow, 276 lin. ft. 18 to 36-in. corrugated metal culvert, etc.—L. A. Gillett, state hwy. engr., Capitol bldg.

**N. Y., New York.** 2pm, Nov. 14.
Furnishing 100,000 wood paving blks.—E. F. Boyle, pres., boro of Manhattan.

**N. C., Raleigh.** Noon, Nov. 18.
21 mi. state hwy. in Lenoir co., involving 6.82 acres clearing and grubbing; 29,650 cu. yd. earth excav.; 89,237 cu. yd. earth borrow, 200,067 sq. yd. concr. or sheet asphalt; or warrenite or topeka pavement; 1,066.11 cu. yd. class A., 212.63 cu. yd. class B and 62.41 cu. yd. class C. concr. for structures; 74,877 lbs. reinforcing steel for structures; 1,400 lin. ft. 4-in. tile drain; 402 lin. ft. 6-in. terra cotta pipe, 18 lin. ft. 12-in. pipe and 40,194 ft. drainage ditches.—W. S. Fallis, state hwy. engr.

**O., Columbus.** Nov. 14.
43 mil. new roads of various types of concr., macadam and brick in Adams, Auglaize, Jefferson, Lucas, Morrow, Mercer, Medina, Morgan, Perry, Pickaway and Tuscarawas cos., est. cost $1,205,050; also bridge in Trumbull co.—State hwy. dept. A. R. Taylor, hwy. comr.

**O., Cleveland Heights.** Noon, Nov. 17.
Grading, draining, curbing and paving with brick, asphalt, concr. or macadam in 2 streets.—F. A. Pease Engrg. Co., 805 Marshall bldg., Cleveland.

**Okla., Muskogee.** Nov. 15.
Gravel surfacing 36 mi. 18-ft. hwy. to cost $400,000.—T. P. Clonts, engr., 2110 Garland ave.

**Okla., Tulsa.** 2 p. m., Nov. 23.
Grading and draining openings in various roads in Tulsa co.—D. V. Patton, co. engr., courthouse.

**S. Dak., Rapid City.** 9 a. m., Nov .17.
54,000 sq. yd. portland cement concr., asphaltic concr. bitulithic, sheet asphalt or vitr. blk. paving in 7 small paving districts.—T. H. Johnson, constg. engr., Sioux City, Ia.

**Tex., San Angelo.** 2 p. m., Nov. 20.
Hwy. impvy. in Tom Green co., involving 49,510.76 cu. yd. earth excav.; 3,378.53 cu. yd. rock excav.; 59,811.10 borrow; 56.32 acres clearing and grubbing; 49,180.70 cu. yd. crushed stone hauled and spread; 315,117.80 cu. yd. crushed stone hauled additional one-quarter mile; 88,525.20 gal. asphalt; 1.936.16 cu. yd. concr.; 72,267 lb. steel, etc.—J. E. Beavers, co. engr.

**Tex., Cisco.** 7.30 pm, Nov. 12.
13,000 sq. yd. street paving, 4,200 ft. combination curb and gutter, 3,500 ft. separate gutter, 600 ft. separate curb, 700 ft. double gutter, 800 sq. yd. 6-in. concr. paving—H. Exall Elrod Co., engrs., Dallas, 209½ Lane st.

**W. Va., Wayne.** 1 p. m., Nov. 13.
Grading and draining various streets.—H. A. Levering, engr., courthouse.

## SEWERAGE.

**Cal., San Diego.** Nov. 15.
Sewer and water system and fuel oil storage reservoir.—Bureau of Yds. and Docks, Navy Dept., Washington, D. C.

**Ill., Witt.** 8 p. m., Nov. 19.
10,000 lin. ft. 8-in., 9,000 lin. ft. 6-in. and 18,000 lin. ft. 4-in. cast iron water mains with connections and fittings.—Miller, Holbrook, Warren & Co., 416 Millikin bldg., Decatur.

**Ia., Des Moines.** Nov. 14.
37 mi. sanitary sewers and one electrically operated two unit pumping plant—J. M. Tipple, constructing engr., city hall.

**La., New Orleans.** Noon, Dec. 15.
Sewerage and water works.—F. S. Shields, secy., Sewerage and Water Board.

**Minn., Elmore** 8 pm, Nov. 13.
Storm and sanitary sewers—S. R. McQuarie, vil. recorder.

**N. J., Newark.** 10 a. m., Nov. 25.
Completion of constr. of sect. 2 of outfall pressure tunnel beneath portion of New York bat and Jersey City in Hudson co., N. J.—Passaic Sewerage comrs., Essex bldg., 31 Clinton st.

**N. Y., New York.** 11 a. m., Nov. 14.
Temporary sewer and appurtenances in city street; sewer and appurtenances in various streets.—M. E. Connolly, pres., boro of Queens.

**N. Y., New York.** 2pm, Nov. 14.
Reconstructing sewer in city street—E. F. Boyle, pres., boro of Manhattan.

**O., Canton.** Noon, Nov. 12.
Storm and sanitary sewers.—F. A. Pease Engrg. Co., 806 Marshall bldg., Cleveland.

**O., Toledo.** Noon, Dec. 9.
Contr. no. 1 of Ten Mile Creek intercepting sewer, consisting of a 72-in. circular sewer, 17,080 ft. long and one 1,400 ft. long, manholes and appurtenances.—D. H. Goodwillie, dir. pub. serv.

**Vt., Burlington.** noon, Dec. 22.
Tile underdrain in city street—T. W. Dix, engr.

**Wash., Wenatchee.** Nov. 24.
Improving avenue by sewers, catch basins, inlets, etc.—City engr.

## WATER SUPPLY.

**Cal., San Diego.** Nov. 15.
See "Sewerage."

**Colo., Vona.** Nov. 15.
Installing water works system and electric light plant.—R. D. Salisbury, engr., 1415 East Colfax ave., Denver.

**Ia., Corydon.** 7 p. m., Nov. 17.
Earth dam, dumping station and filter plant.—H. G. Hall, engr., Centerville.

**Neb., Norfolk.** 5 pm, Nov. 17.
Water system, involving 7,748 lin. ft. 4-in., 1,820 lin. ft. 6-in. cast iron water main, 16 fire hydrants, 12 brick valve boxes, fittings, etc.—S. R. McFarland, city clk.

**Neb., Randolph.** 8.30 p. m., Nov. 30.
Extending water mains (4-in.)—Ray Kirk, clk.

**N. Y., West Haverstraw.** 3 p. m., Nov. 20.
Water tank and connections, new boiler, etc. at N. Y. State Hospital for Crippled and Deformed Children.—L. F. Pilcher, state archt., State Capitol, Albany.

**Okla., Shattuck.** 2 pm, Nov. 12.
Water and lighting impvts. as follows: Furnishing cast iron pipe and special castings; hydrants and valves; general constr., including trenching, pipe laying, pole line equipment and constr., well houses and connections, and building impvts.; furnishing and erecting pumping and lighting equipment, including Unaflow engines and generators, boilers, heater, switch-board and pumps; constructing 2 wells, including casing, or 1 well with concr. pit—Burns & McDonnell, engrs., 402 Interstate bldg., Kansas City, Mo.

**Ont., Toronto.** Noon, Nov. 18.
Supplying water meters.—Works dept., room 12, city hall.

## LIGHTING AND POWER.

**Ill., Chicago.** 11 a. m., Nov. 14.
Furnishing and installing entire electrical equipment for double-decked bascule bridge over Chicago river.—Room 406 city hall.

**Ia., Maquoketa.** Noon, Nov. 19.
Supplying and erecting one 250 B. H. P. Diesel type engine direct connected to 210 K. V. A. generator with belted exciter, oil tank, pole and line material, switch board and station equipment, meters, transformers, etc.—G. O. Morse, supt. or W. E. Skinner, engr., Lumber Exchange, Minneapolis, Minn.

**Minn., Ely.** 8 p. m., Nov. 18.
Furnishing three 200 H. P. water tube boilers; also one jet condenser with double acting air pump.—A. Knutson, city clk.

**Okla., Shattuck.** 2 pm, Nov. 12.
See "Water Supply."

**P. R. Point Borinquen.** Dec. 17.
Light station here.—Comr. light houses, Washington, D. C.

## FIRE EQUIPMENT.

**Cal., Sacramento.** 11 am, Nov. 12.
Furnishing 1000 ft. 2½-in. cotton rubber lined, double-jacket fire hose, coupled in sections of 50 ft. each, with expansion ring couplings, equipped with Pacific Coast standard thread—M. J. Desmond, city clk.

**D. C., Washington.** 2 p. m., Nov. 14.
7,000 ft. 1⅛-in. double jacket cotton rubber lined, mildew-treated spraying hose, with Albee Kant-slip improved quick hitch couplings and 2½-in. 500 ft. suction hose.—Bd. Awards, Dept. Agriculture.

**N. H., Franklin.** 2 p. m., Nov. 14.
Furnishing high power spraying hose and suction hose.—Dept. Agriculture, Washington, D. C.



## BRIDGES.

**Ida., Boise.** 8 p. m., Nov. 14.
One 32x19-ft. concr. bridge over Moon creek in Shoshone co.—Director hwys.

**Mich., Lansing.** 1.30 pm, Nov. 25.
State reward bridges nos. 4, 10, 41, and 42—F. F. Rogers, state hwy. comr.

**Minn., Bemidji.** 2 pm, Dec. 5.
Furnishing and installing 30 culverts of corrugated metal on judicial ditch no. 36 and 30 metal culverts on judicial ditch no. 39, average haul 40 mi.—A. D. Johnson, co. aud.

**O., Pomeroy.** Nov. 12.
One concr. abutment and walks for bridge in Rutland twp., Meigs co.—Co. surv.

**O., Circleville.** Nov. 17.
Concr. bridge in Washington twp., Pickaway co.—Co. engr.

**O., Columbus.** Nov. 24.
Asphalt pavement for bridge over Alum creek, involving 950 sq. yd. asphalt.—Co. engr.

**Pa., Uniontown.** Nov. 12.
Doble 20-ft. rein. concr. bridge over Mounts creek; also double 28-ft. span rein. concr. bridge over Mounts creek; and placing concr. floor on 37-ft. 9-in. span bridge over sand stream.—Co. engr.

**Tex., Ringgold.** 11 am, Nov. 12.
Steel bridge over Belknap creek, consisting of one 75-ft. main span and 2 approach spans 30 ft. each, two concr., piers, 25 ft. high and two bois d'arc piling abutments—J. R. Hill, co. engr., Bowie.

## MISCELLANEOUS.

**Ia. Toledo.** Nov. 25.
System of tile lines—V. P. Conkey, Tama co. engr.

**Mich., Detroit.** 11 a. m., Nov. 25.
Dredging and rock excav. on Livingstone channel, Detroit river.—U. S. Engr. office.

**Minn., Waseca.** 2 pm, Nov. 22.
Co. ditch no. 19, involving 1,850 ft. 18-in. and 1,900 ft. 14-in. tile, one concr. bulkhead, 2 surface inlets, etc.—T. Peterson, co. aud.

**Mo., St. Louis.** 11 a. m., Nov. 17.
120,000 cu. yd. earthwork in East Cape Girardeau and Clear Creek drainage dist., Ill.—Secy., Mississippi River comn., 1311 International Life bldg.

**N. Y., New York.** Noon, Nov. 21.
Dredging in channel between Staten Island and Hoffman and Swinburne Islands, New York harbor.—U. S. Engr. office, 39 Whitehall st.

**N. Y., Albany.** Noon, Nov. 25.
Improving state canals as follows: Completing prism excav. between Fairport and King's Bend; completing excav. of canal channel in Genesa river; also constructing barge canal terminals; extension to existing docks at Cohoes; barge canal terminal at Hallet's Cove, boro of Queens, N. Y. C.; furnishing and installing four 2-ton electric semi-portal revolving jib cranes on Barge canal terminals, two each at Greenpoint and West 53rd st., N. Y. C.; constructing headhouse and installing water main and electrical work on pier 93, West 53rd st., N. Y. C.—E. S. Walsh, supt. pub. wks., Capitol.